TIRON

DRAGON USER

The independent Dragon magazine

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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extent depend on the quality of the discoveries that you can make with your Dragon. The Dragon computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Contents



Editorial

UNQUESTIONABLY, one of the major personal achievements of the last 18 months was the Band Aid/Live Aid appeal, started by an individual as unlikely as pop-star Bob Geldof. Moved by scenes of mass starvation in drought stricken East Africa, his idea of "getting people off their backsides" (astonishingly passed over in the New Year's Honours List) swept the country and culminated in the global event known as Live Aid, last summer. And there were plenty of spin-offs too; Fashion-Aid, Opera-Aid, Camera-Aid . . . and more relevant to the home computer industry, Soft-Aid.

Masterminded by ex-Quicksilva supremo (now Electric Dreams MD) Rod Cousens, this compilation tape raised over £350,000 for the Ethiopian appeal — a fine effort by everyone concerned. There was just one problem for Dragon owners however — the tape was only for Spectrum and Commodore machines — which left us just a little bit out in the cold.

Following the success of Soft Aid, another charity tape is being prepared as I write. Entitled "Off the Hook", the proceeds from its sale will go to the Princes Trust for Drug Abuse Rehabilitation — an organisation concerned with helping drug addicts beat their addiction. A worthy cause indeed. And the good news for the computing community is that even more people can join in the effort, as Amstrad and BBC have been added to the list of machines catered for. But — still no Dragon.

OK, so maybe we understand the commercial reasons for not including us, but that still leaves a minimum of 50,000 odd active Dragon owners all dressed up with nowhere to go.

Of course, someone could always "get off their backside," but that only happens in fairy stories — doesn't it?

Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Good Showing

RE THE November 6809 Show. I felt that the show this time was not quite as good as previous ones, but it is needed to keep the Dragon alive. I always enjoy looking for special offers and the chance to look at and try the new hardware.

Having started with the Dragon as a games machine, I am now looking for much more useful educational software for my 11-year-old daughter, and am using the machine with Disc Drive and using Word Processor packages and programming aids.

We need Dragon User. We need a 6809 show. We definitely need all new information and advertisers.

Bryan Smith

Book Errata

THANK YOU for arranging the special offers with the Melbourne House. I have studied the book *Dragon Machine Language for the Absolute Beginner* for several weeks. It is most interesting and can be recommended to persons like myself who are beginners.

There are, however, a number of errors which are most confusing. They are:

1. There are 27 simple specimen programmes in Chapter 14. None will work because of an elementary error in the loading program on page 128. To rectify, one must move the contents of "line 00" to a new line position, eg as "line 25".

2. There is a major loading program on page 155. It has an error in the subroutine which begins with line 600. The subroutine is intended for trials of machine code segments, but it does not have an "exec", or a "usr" statement. The program may have another error in the subroutine starting with line 400. I could not make it work, but this may have been because I did not know what it was supposed to do. Finally, I do not understand the purpose of "line 5" of this program.

3. There is a big mistake in the specimen program "MUSIC". On page 197, starting at address &H4086, the hexadecimal entries should be 5E, 26, 87, 28, D2, 2B, 3F, 2D, D2, 30, 8B, 33, 6E, 36, 7D, 39, BA, 3D, and 3B.

In spite of the above defects, it is a most interesting book.

J B Slinger
Tylers Green
High Wycombe
Bucks

Bulletin News

HAVING recently started running a small bulletin board on my Dragon 64, I was wondering if you would be so kind as to inform other Dragon users about the service, through the pages of *Dragon User*. The details are as follows:

The board runs at 300/300 baud, 7 data bits, even parity, 1 start bit, 1 stop bit, and is on line 6 nights per week (Saturday to Thursday) 9.00 pm until 7.00 am, on the above number. The board auto answers and 20 minutes per call is allowed. Although running on a Dragon 64 there are users of other machines use the system, ie, Apple, BBC, Amstrad, etc. The board is called "walley" and was written with the intention of introducing some humour to the BBS scene.

M. G. Armitage
101 South Terrace
Wales Bar
Sheffield S31 8QL
Tel: (0909) 773564

Pokes

NOTICING that the only hint/tip for games for ages was the one for Jet Set Willy (great!), I decided to send in some Pokes I've found myself. Most of the games are getting on a bit, but hopefully that means most people will have them! Here they are then:

THE BELLS (keyboard version only) — Poke 10729,0-255 (lives)
CUTHBERT IN SPACE — Poke 7573, 0-255 (lives)
BLOCKHEAD — Poke 10552, 0-255 (lives)
TEATIME — Poke 16643, lives
MONSTERS — Poke 23628, 0-255 (lives)
DUNKEY MUNKEY — Poke 15121, 1-127 (lives)
CHOPPER STRIKE — Poke 13108, 0-255 (lives)
POGO-JO — Press zero for 'skill level' — your points, which usually go up in 10's will go up in 1000's!
EDDIE STEADY GO! — type "FIDDLE" when the game starts (after pressing the up cursor key). Now using the left and right cursor keys, you can go forward and backward through the screens.

I hope these Pokes are of use!

Robert Gooding
52 Tollerton Drive
Irvine
Ayrshire

Leap Year

I HAD always understood it to be common knowledge that Pope Gregory XIII amended the leap year rule in 1582 and not, as written on Page 42 of the January 1986 edition of Dragon User, 1577.

This would be of little concern to me were it not for the fact that it caused me to lose a bet with my Father!

Peter Caldwell
23 Squitchey Lane
Oxford
OX2 7LD

Any other birds for the exact date of this momentous event? Meanwhile, Peter, may this exercise be a lesson to you on the perils of indulging in gambling. (Send an SAE for definitive list of vices less damaging on your pocket).

Value

PAUL GRADE is so right about the National Dragon Users Group. The newsletter, "Dragon Update", is filled with useful information. Correspondence with several Group members gave me the information necessary to get my OS9 software operational (no thanks to the manuals) as well as introducing me to other Dragon users in Israel. They are the Dragon "Buy of the Year".

Harry C. Taylor II
Israel

Power Pack

AS SOMEONE occasionally asked to repair Dragon 32 computer bits and pieces, I have noticed two or three letters in your mag about the mains transformer burning out.

I have now had three burnt-out transformers sent in for repair in the last two months (they are irreparable of course), but the cause of the problem in every case is that the input plug to the rear of the computer has had a loose cable grip screw. The wires inside have twisted around each other and short circuited, burning out the power transformer secondary.

I would advise every Dragon owner to immediately check that the cord grip screw in the grey covered power plug from the transformer to the Dragon is securely tightened. Even better, open up the plug and check all the soldered connections are OK with no exposed wires inside.

An even better solution would be to break the transformer to computer lead and insert fuses and fuseholders in the line, thus protecting the transformer.

Really, this transformer would be better out of its box, and fitted in a larger, ventilated box along with its new fused protections — if you are technically minded.

I am still working on a suitable replacement transformer for the Dragon, but I would advise people whose transformer has burnt-out to check their machine on someone else's transformer as internal damage could have been done to their Dragons, as well as the transformer.

N Brierley
5/6 Waterfall Cottages
Marsden
Huddersfield

Thanks for those tips . . . we would emphasise that you should only attempt any repairs or modifications to your transformer if you have the necessary technical competence or you could be letting yourself in for a whole bigger bunch of trouble.

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News desk

If you have any new products for the Dragon — software or hardware — ring the News Desk on 01-437 4343

Incentive — new release

INCENTIVE wish to stop the spread of any scurrilous rumours (started heaven knows where!) that they are halting development of new Dragon games, by announcing the development of their next opus, Time Lord, for the Dragon 32.

Described by Incentive's Ian Andrew as, "a multi-screened 3-D arcade adventure," the plot involves destroying the evil arch villain Naco. During the game. You must explore Naco's castle, seeking out and battling with various guardians, to locate parts of a magic talisman which will gain your access to the Inner Temple where Naco lies sleeping . . . and then on to the final confrontation.

This is the first Dragon game written by the long-time Incentive stalwarts Peter James and Roger Trask, but with the promise of 'Marble Madness type 3-D,' the omens look good. Time Lord should be available around mid-May from Incentive, priced at £7.95. Contact them on 0734 591678.



Re Dragon User News Desk last month, the Incentive Moon Cresta competition to win an original Moon Cresta arcade machine will close at the end of 1986 — so don't say that you've not got time to practice.

Juxtaposition delay

THOSE adventurers waiting for Juxtaposition Part Two (Usurper of Rune) are going to have to wait that little bit longer than expected — as Wintersoft are having trouble fitting it all in memory.

"The game is going to be released later than anticipated," said Wintersoft's John Humphries, but is hoping for an Easter launch, "if all goes well." This compares to the original launch date of mid-February.

The actual game design has been extended to produce a bigger game — possibly in two parts. The first part concerns the task of gathering together a band of companions to face the might of Baroness Black. The second part (a combination of strategy and conventional adventuring) deals with the confrontation itself, as you battle it out with the Evil Hordes. The program will feature some drawn graphics, as well as the "Panoramic Graphics" that were such a hallmark of the original.

For further details, contact Wintersoft, 30 Uplands Park Road, Enfield, Middlesex, EN2 7PT, 01-367 5720.

Total Eclipse — the public wait

BIRMINGHAM based Software House Fenmar Ltd have recently been the subject of investigation by West Midlands Consumer Services, following complaints from dissatisfied customers passed on to them by Dragon User. Company spokesman David Beresford blames faulty tape duplication and other technical problems on the delay in dispatch of their first release Total Eclipse, but is confident that orders will be fulfilled by the end of January. He added, "if anyone requires a refund, rather than waiting for the game, we can send a cheque within 48 hours."

West Midlands Consumer Services can be contacted on 021-784 2525 — contact Mrs S. Lewis.

Dragon User People's Chart

'Power to the People' is our motto here at Dragon User — so this month (and every month!) we are now going to offer you the chance to air your personal preferences to the software producers, by voting in the Dragon User People's Chart.

Ever since the majority of retail outlets ceased stocking Dragon programs (so that sales are now even more difficult to assess), the Dragon scene has lacked that one thing any self-respecting micro must have — a chart. Love it or hate it, a chart is a useful thing, if only to check to see if everyone else shares your good taste.

So, ever with the reader in mind, we are now instigating a People's Chart — for you to vote for your top five Dragon programs (games, utilities or applications) each month.

And just to make it that little bit more interesting, this month Microdeal are offering £25 worth of software (of your own choice) to the winner of our associated anagram competition. Who said anything about a competition?

Well, to make things even more interesting than that, we're asking you to construct an anagram from your top three — the cleverest winning the goodies. Give it a try . . . you know it makes sense!

This is what you do

Each month, Dragon User will be compiling its own special Dragon software Top Ten chart — compiled by you!

And each month we will be sending £25 worth of Microdeal software to the person who sends in, with their personal top five, the most original phrase or sentence made up from the letters (you don't have to use them all) in the titles of their top three programs.

You can still vote in the chart without making up an anagram — but you won't be in with a chance of winning the prize.

All you have to do is fill in the form below (or copy it out if you don't want to damage your Dragon User) and send it off to: People's Chart No. 1, Dragon User, 12-13 Little Newport St, London WC2H 7PP.

Chart Two

Voting for Chart No. 1 closes at 1pm on Friday 14th March 1986. Entries received after that time will not be eligible for inclusion in that month's voting. The editor's decision is final. Only one entry per individual per month will be allowed.

My top 5: Voting Month 1

1. ....
2. ....
3. ....
4. ....
5. ....

Name ....

Address ....

....

....

....

....

My phrase is: ....

Communication

Send in you questions, requests, and pleas to Communication, Dragon User, 12-13 Little Newport Street, London WC2

Problem: Wanted! Has anyone out there got a copy of Dragon Forth by Oasis Software. Any price paid, but must have instructions. Must be in fairly good condition.
Enquirer: Eram Rizvi, 34 Norwich Road, Thornton Heath, Surrey CR4 8NA.

Problem: Need merge or append routine for Basic and/or machine code.
Enquirer: David Pipe, 44 Friars Avenue, Shenfield, Essex CM15 8HU.

Problem: I am at present working on my 'O' level computer project which is a database built to work a Dragon plus tape unit. I am finding difficulties when it comes to file handling (ie, record searching and file extension). Can anyone recommend a good book
Enquirer: Michael Walker, 77 Lynton Avenue, Collier Row, Romford, Essex RM7 8NH.

Problem: I have a Dragon 32 with DragonDos disk system. Recently I was using a graphic program, when the disc started to motor. Afterwards, I listed the directory and found that although it was showing the correct amount of free space, it did not list the last few programs. Is there any way of recovering these lost programs?
Enquirer: P. J. Webb, 41 Goddard Avenue, Swindon SN1 4HS.

Problem: Could anyone explain how to determine the addresses for CSAVE, CLOAD, EXEC and CLEAR? Also the same for assembler programs (ORG & PUT) written with Alldream.

What do I have to do with PRT and END and labels like ROUTINE and how to CSAVEM from Alldream? I am a complete beginner in machine code.
Enquirer: Luc Bressinck, Warandestraat 37, 2648 Steendorp, Belgium.

Problem: I am hoping to use my computer to control my very complex model railway. The only problem being is I wish to use infra-red remote control, where the computer produces the frequencies and the necessary data for the decoder.

I do not know much about the output from my Dragon or which is the best port to use.

I have to use machine code but I am not sure how to address the necessary parts of memory for controlling the output ports. I would be very grateful if anyone could help me.

Enquirer: S. J. Taylor, Fernery Lane, Barnetby, South Humberside DN38 6HN.

Problem: I am now using a Cumana DOS with my Dragon 64 and am anxious to convert a number of my programs to Disc Operation. Unfortunately the Cumana manual, and Cumana themselves, are not too helpful.

Can anyone please give me some assistance?

Enquirer: Peter Sturgess, Byways, Oak Lane, Broadbridge Heath, Horsham, Sussex RH12 3LX.

Communication

Stuck for a routine? Need some obscure equipment? Feeling cut off? Fear not — someone, somewhere can help you! Write down your problem on the coupon below (make it as brief and legible as possible) together with your name and address and send it to Communication, Dragon User, 12/13 Little Newport Street, London WC2H 7PP. We'll publish it as soon as we can — meanwhile, maybe there's someone you can help this month!

Problem..

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Flee! Flea!

A superlative maze game by the team of ***Dave Rogers*** *and* ***Colin Hogg***

YES, this is a mazechase/Pacman type game, but we have given it its own definite style and flavour, from the untypical use of the Dragon's resolution modes (avoiding the usual Dragon blandness) to the distinctive and devious designs of the mazes. To play, it is fast, challenging, and we believe as good as (or better than) any game of this genre available for the Dragon.

All the features expected of a good mazechase are included; multiple tunnels, power rings, mouth open in four directions, bonus fruits, a *highly* intelligent player-seeking algorithm, up to six 'Progressively aggressive' opponents (and bonuses for catching them!), six different screens and colours, extra lives for clearing them, and so on – yet the program is relatively short. Other main features include a control key response tailored to allow 'anticipation' when turning corners (giving much smoother play), 14 different sound effects/tunes, and a *fully* functional demonstration mode, which also cycles through the six screens, so even if you can't clear them all yourself at least you can sit back and see what you're missing!

The only compromise we have made in the program is a slight delay between certain screens (15 secs) while video modes are altered, etc. to do this any faster would have required considerably more code.

Overall approach

We use a 'notepad screen' system, and this is well worth describing because the concept could usually apply to almost *any* micro. The game is actually played on the Dragon's low-resolution (text) screen, which is block/character mapped and folded in a simple, straight-forward way, starting at address 1024. Only those parts that change on this reference screen are translated, by means of a machine code scan, onto a hi-res 'slave screen', the latter being the only screen actually seen by the player.

By using this method, all of the game logic can be programmed using normal character codes and pokes on to a simple screen, which can also be easily peeked-at to perform collision checks, route-seeking-scans, tunnel moves, etc.

Meanwhile, the viewed screen can be made as detailed as you like and its characters and colours can be switched around without affecting the actual operation of the game in the slightest! Since the notepad screen is never actually seen (unless you press Break) it doesn't matter what it looks like, so you also gain the freedom to choose characters with codes that make the programming easier. For example, we arranged all the characters that are valid or invalid (for the player or for the 'fleas' to move on to) into easy-to-differentiate numerical groups.

To update the hi-res screen we use three different machine code subroutines: While we are describing these the main machine code functions will also be covered:

(1) **Exec Hiup (Hiup = 31531).** This updates the entire screen, but is too slow to be used all the time because it has to scan the 32 × 16 characters on the notepad screen, then refer to bit-pattern-tables to find the corresponding hi-res characters and poke a total of 32 × 192 bytes of these onto the hi-res screen (you can see the speed of this scan when it does a colour change 'wipe-down' between screens two and three).

(2) **Exec 31565.** Updates the score display only (top left). Used for example when bonus is being counted up.

(3) **USR 00 (address is 31067).** This calls the main machine code routine that takes care of ALL flea-movements. It moves the fleas about the notepad screen as dictated by the player-seeking-algorithm, etc, (the player's position being passed via *S* in Line 50) but then it also updates specific areas of the hi-res screen, these being: Each of the flea's positions/each flea's previous position (replacement characters)/the player's position/above, below, left and right of the player (so whichever way he was moving the update will rub-off his previous position), and finally, the score display. This main routine *also* does the following: scans the screen for dots to see when it had been cleared detects when the player has been caught by a flea/if a power ring has been eaten then it starts to decrement the value in the power ring counter (address 31037) and detects when this reaches zero. It accordingly returns to Basic with a number between one and four, which is then used by the On–Goto in Line 50 to reach the appropriate Basic routine ('1' for screen cleared, '2' for power ring expired, '3' for normal, '4' for player hit).

Poke Hex FF22 Video colour control.

Exec 31042 Initialises 'flea' stories with start positions, etc.

Poke Hex FFC3/FFC5/FFC7 Selects video mode used.

Typing-in Use

The machine code data-lists and the strings holding the compressed mazes data are all checksummed, so your first few runs will almost certainly result in error messages directing you to look at certain lines and correct typing mistakes. Unlike Sinclair machines, the Dragon checks lines in Run time, not when entered, so you should select Demo mode and leave it to cycle through all six mazes and tunes so as to give the program the opportunity to spot any mistakes. Having corrected all errors don't forget to re-tape a few copies!

NB: Line 960: All *inverse* characters: A, A, six I's, A,B,A,I, twenty A's

Line 870: "Press P to play, D for Demo"

The well-known 'speed-up' Poke in Line 335 will work on most Dragons but not all! If it doesn't, then just erase the line and since we used it only to accelerate maze decoding, the main game will still run at the same speed.

Do *not save the game in Fast Mode*, it won't load back!!!! If in doubt poke HEX FFD6,0 to return to Slow Mode.

Playing

At any time during active demo mode or at the end of a game you can press 'P' to play, and during play you can pause by pressing Shift/@. Screen one is particularly easy, while screens four (Sandy Castle) and five (Face the Face) are particularly difficult, but not impossible! In fact there are quite easy ways to clear all the screens, we have both done it, but unlike inferior Pacman type games, it needs practice and the formulation of definite strategies!

Modifications

(1) If you need to slow the game down add: **24** FOR DE = 1 to 20: NEXT DE. The delay figure of twenty can then be adjusted up or down to find your most comfortable speed.

(2) To make an *Autorunning* version just add these lines.

```
12000 CSAVEM "FLEE", 157, 17000,0
12010 POKE 27,66 : POKE 28, 104
12020 SOUND 200,10
12030 RUN
```

To save, type RUN 12000.

To load this version you must use CLOADM since the autorun works by saving the whole program as a machine code file, with the two Pokes to restore 'End of Basic' pointers (we have deliberately over-estimated the latter in case you accidentally type in more spaces than intended, making the program slightly longer than as listed). It is best to still keep a tape of the normal version as a back-up copy.

(3) If you feel you must alter the keys used for control then you must *also* change the string *'ZCNJ'* in Line 10 to the same letters, otherwise demo mode will not work at all.

(4) This program will work on the Dragon 64 if you change USR(00) in line 50 to USR(0).

Ready-typed versions of this program (including an expanded autorunning version of one side) are available for £2.00 from: J. Rogers, 11 Carnarvon Road, Walton, Liverpool, L9 1EB.

```
5 RUN 800:REM C.HOGG/J.D.ROGERS
10 IF DEM=0 THEN:K$=INKEY$:ID=0:
ELSE: IF PEEK(S+M)<20 OR RND(16)
 >14 THEN:K$=MID$("ZCNJ",RND(4),
1):IF INKEY$="P" THEN 820
11 IF K$="Z" THEN ICH=27:ID=-1
12 IF K$="C" THEN ICH=28:ID=1
13 IF K$="J" THEN ICH=25:ID=-32
14 IF K$="N" THEN ICH=26:ID=32
15 IF PEEK(S+ID) >1 THEN:CH=ICH:
M=ID
20 IF PEEK(31037) THEN CH=19
30 IP=S+M:IF PEEK(IP)<>24 THEN G
OTO 100 ELSE:IF RND(128)>126 THE
N POKE 31008,21
40 POKE S,24:POKE IP,CH:S=IP
50 ON USR 00(S)GOTO300,60,10,700
60 POKE S,27:PLAY"O2T64L1FEDT254
L254":GOTO 50
70 PLAY"EFEFEF":POKE S,24:EXEC H
IUP:GOTO 40
100 REM-------HITCHECKS------->
110 H=PEEK(IP)
120 IFH=22THEN:PLAY"C":GOSUB200:
GOTO40
125 IF H<2 THEN 50
130 IF H=3 THEN:IP=IP+30:GOTO 70
140 IF H=4 THEN:IP=IP-30:GOTO 70
150 IF H=23 THEN:PLAY"O5L1;CGDGE
GFGABL254":POKE 31037,70-(7*MZ A
ND DEM=0):CH=19:GOTO 40
160 IF PEEK(31037) THEN:IF H<9 A
ND H>4 THEN FOR N=5 TO 8:POKE IP
,N:POKE S,27-(PEEK(S)=27):EXEC H
IUP:PLAY"FB":NEXT N:FOR BO=1 TO
PEEK(IP):U=1030:GOSUB 210:EXEC 3
1565:NEXT BO:GOTO 40
170 IF H=21 THEN:PLAY"AGA":U=102
9:GOSUB 210:GOTO 40
180 GOTO 50
199 REM---SCORE SUBROUTINE---->
200 U=1031
210 POKE U,1+PEEK(U):IF PEEK(U)=
19 THEN:POKE U,9:U=U-1:GOTO 210
220 RETURN
300 REM----SCREEN CLEARED----->
310 GOSUB 4000:REM(TUNES)
320 FOR BO=1 TO MZ*27:GOSUB 200:
EXEC 31565:IF(BO AND 14)=0 THEN
PLAY"O5T255L255;FGABCDE"
325 NEXT BO
330 MZ=(MZ AND MZ<6)+1
335 POKE &HFFD7,0
340 IF LIF<9 THEN:LIF=LIF+1:POKE
 1035,LIF+9
342 FCON=FCON+(FCON+1 AND MZ<>3
AND FCON<1024):DPH=FCON
344 FOR F=31005 TO 31035 STEP 6
346 POKE F,DPH AND 31:POKE F-1,D
PH AND 31:DPH=INT(DPH/2)
348 NEXT F
350 REM--CHANGE COLOUR/RES----->
351 IF(MZ AND 1)=0 THEN 385
355 P$=MID$("000FF0FF8095AABFC0D
5EAFF000FF0FF",1+INT((MZ-1)/2)*8
,16)
360 FOR N=1TO8 STEP 2:SOUND192,1
365 BP=VAL("&H"+MID$(P$,N,2))
370 NBP=VAL("&H"+MID$(P$,N+8,2))
375 FOR U=31627 TO 31926:IF PEEK
(U)=BP THEN POKE U,NBP
380 NEXT U,N
385 COL=COL+1 AND 1
390 IF MZ=1 THEN COL=COL+1 AND 1
395 POKE &HFF22,(21+COL*8 AND MZ
<5)+(246+COL*7 AND MZ>4)
400 REM------MAZES DATA------->
410 IF MZ=1 THEN S$="AAAAAAAC,A8
215548,A82AAA08,A820C208,482AAA0
8,48555208,4AAAAAA8,4A822154,AA8
22AAA,85522214,AAAB22A8,85552148
,85552148,AAAAAAAC,55555554:2020
3"
420 IF MZ=2 THEN S$="AAAAAAAA,08
545488,0AA8AA8A,08088008,0AA8AAA
A,054880C8,AAAAAA8A,45455088,AAA
AAA8A,85488088,8AA8AA8A,88488008
,8848800A,ACAAAAA8,00555555:2373
2"
430 IF MZ=3 THEN S$="AAA00000,80
20AAA0,AB208320,52AAAA20,AA208AA
A,80208820,AAA0AAA0,55200800,AAA
0AAA0,80208820,AA2AAAAA,22208320
,2220AAA0,AAA00000,55555555:1855
5"
440 IF MZ=4 THEN S$="A8000000,2A
AAAAAA,21012008,201022A8,AAAAA20
0,555522AA,AAAAA200,54802200,AA8
AAAA8,48880088,A88AAC88,28880AAA
,AC880808,2AAAAAA8,15555554:2048
5"
450 IF MZ=5 THEN S$="AAAAAAAC,15
555215,0EAAAA15,08085215,A84AAAA
A,48085555,4AAAAA15,55485215,AAA
8AAA9,85488549,AA08AA09,52088209
,52088209,AAAAAAAD,55555555:1917
5"
460 IF MZ=6 THEN U$="A88888A880A
":U$=U$+U$+U$:S$="0000ABAAAAA"+U
$+U$+U$+"AAAAAAAAAE8000005555555
5:23974":MID$(S$,64,2)="4C"
500 REM-----MAZE DECODER------>
510 SUM=0 :S=1 :FOR L=1071 TO 15
36 STEP 32
520 FOR A=1 TO 16 STEP 2
530 N=VAL("&H"+MID$(S$,S,1)):S=S
+1
540 H=INT(N/4):LO=N-4*H:K1=H+(20
 AND H>1):K2=LO+(20 AND LO>1)
550 POKE L+A,K1:POKE L-A+1,K1
560 POKE L+A+1,K2:POKE L-A,K2
570 SUM=SUM+(K1+K2)*A:NEXT A
580 EXEC HIUP:SOUND 200,1:S=S+1
590 IF K2=22 THEN POKE L+16,4:PO
KE L-15,3
600 NEXT L:IF SUM<>VAL(MID$(S$,S
))THEN:CLS:PRINT "ERROR,PLEASE C
HECK LINE";400+MZ*10:END
610 S=1072:IF DEM THEN:M=1:S=108
8+RND(432):IF PEEK(S)<>22 THEN G
OTO 610
620 POKE S,27:EXEC31042:POKE 310
37,10:POKE&HFFD6,0:PLAY"O2;T254;
L254"
630 GOTO 10
700 REM-----PLAYER HIT-------->
705 IF DEM THEN:IF LIF=6 THEN LI
F=8:GOTO 300
710 FOR N=25 TO 32:POKE S,N-(4 A
ND N>28):EXEC HIUP:NEXT
720 LIF=LIF-1:POKE 1035,LIF+9
730 FOR T=5 TO 2 STEP -1
740 PLAY"O"+STR$(T)+"T10"
750 FOR N=1 TO 6:PLAY"L16"+MID$(
"DEFGAB",N,1)+"P96":NEXT N
760 NEXT T
770 POKE S,24:EXEC HI UP
780 IF LIF THEN 610
785 REM-------GAME-OVER------->
790 FOR N=1 TO 100:POKE S,(N AND
 3)+25:POKE 1033,20*(N AND 1):EX
EC HIUP:IF INKEY$="P" THEN N=4E4
795 NEXT N:GOTO 820
800 REM-----INITIALISE-------->
810 CLEAR 1000,30999:POKE&HFFD6,
0:GOSUB 9000:EXEC 31042
820 CLEAR 1000 :U=0:H=0:K$="":S=
0:IP=0:CH=27:M=0:ID=0:ICH=0:HIUP
=31531:DEF USR0=31067
830 COL=RND(2):FCON=3:TU=1:MZ=0:
LIF=8:DEM=0:CLS
840 PRINT" PAC UP YOUR TROUBLES
IN YOUR    OLD BIT BAG AND":PRIN
T@64,STRING$(32,227)
850 I$="-------FLEE-!-----------
--------- EACH DOT GUZZLED SCORES
 2 POINTS: EACH WHOLE SCREEN CLE
ARED=BONUS AND AN EXTRA LIFE: GR
APES=100 POINTS: POWER PILLS LET
 YOU GET YOUR OWN BACK ON THE FL
EAS (FOR A WHILE), CATCHING A FL
EA=50 TO 80 POINTS --- FLEE !
860 F$=CHR$(128)
870 PRINT@96,STRING$(192,175);:P
RINT STRING$(32,236):PRINT@226,F
$"PRESS"F$"P"F$"TO"F$"PLAY"F$"D"
F$"FOR"F$"DEMO"F$;
880 PRINT@321,"CONTROL KEYS ARE;
":PRINT@390,"Z       C       N       J
           LEFT  RIGHT DOWN  U
P"
```

Continued on page 12

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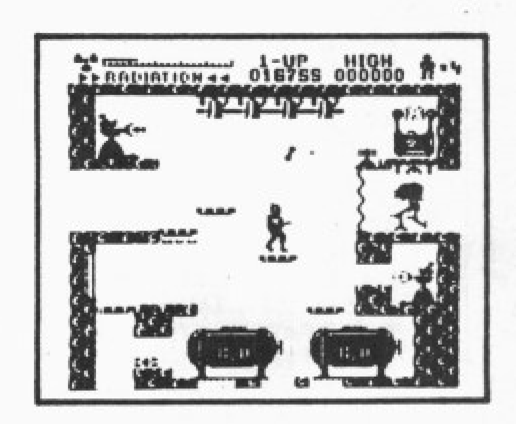
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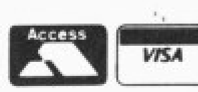
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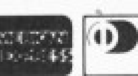
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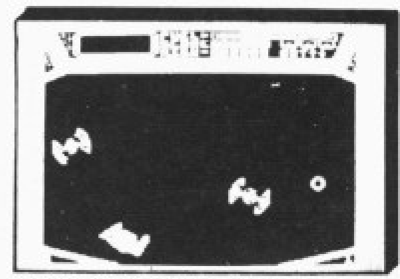




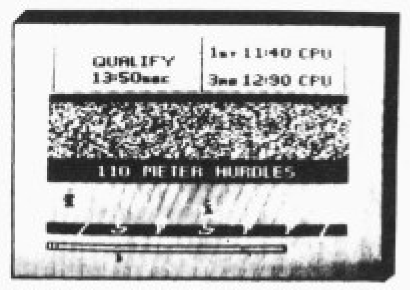
Continued from page 9

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890 FOR N=1 TO LEN(I$)
900 PRINT@129,MID$(I$,N,30);:IF
(N AND 5)=1 THEN PRINT@161,MID$(
I$,N,30);
910 PRINT@453," <       >      V
  ↑"
920 IF PEEK(338)=239 THEN N=999
930 IF PEEK(342)=251 THEN:DEM=1:
N=999
940 PRINT@49+(N AND 15)/2,"-SMIL
E":PRINT@454
950 NEXT N:GOSUB 4000:IF N<900 T
HEN 890
960 PRINT@0,"[illegible]
[illegible]";STRING$(255,116);
STRING$(224,116); :POKE 1535,20
970 TU=RND(7)+1:EXEC HIUP:POKE&H
FFC3,0:POKE&HFFC5,0:POKE&HFFC7,0
:POKE&HFF22,21
980 GOTO 330
4000 REM---PLAY 1 OF TUNES----->
4010 TU=(TU AND TU<8)+1:PLAY"V31
"
4020 IF TU=1 THEN:FOR J=1 TO 2:F
OR D=1 TO 16:PLAY"O4T4L16"+MID$(
"DAGFEGFEDCECDEFG",D,1)+"P32":NE
XT D:NEXT J:PLAY"L2A-"
4030 IF TU=2 THEN PLAY"O"+STR$(R
ND(3)+1)+"T4;L6C;P16;L8C;P16;L16
D;L8C;O-;B-;A;B-;O+;L4C;L8A;P8;L
4A;G;L2F;D;C"
4040 IF TU=4 THEN:U$="O3T5L4FL8C
L4.B-L4AL1DL2FL2GL1F":PLAY U$+U$
4050 IF TU=5 THEN PLAY"O3L4T6;DE
FGAFAA;A-EA-A-GE-GG;DEFGAFA;O4DC
;O3AFA;O4CCC"
4060 IF TU=7 THEN:U$="P14;L10D;L
12C;L10ED;L18C;P14;L10F;L12E;L10
DC;L18D":PLAY"O3T1"+U$+U$+"O2L8G
"
4070 IF TU=3 OR TU=6 OR TU=8  TH
EN:C$="CEGCE;AACEC;FACAF;EGDEG;"
:C$=C$+C$+"DG-AD;CDGAG;DG-AD":FO
R X=1 TO LEN(C$) STEP 6:P$="O3T2
4L10"+MID$(C$,X,1)+"O4L24"+MID$(
C$,X+1,2)+"O5L20"+MID$(C$,X+3,2)
:FOR P=1 TO 8:PLAY P$:NEXT P,X
4100 RETURN
9000 REM------HEX LOADER------>
9020 AD=31042:DL=10000:CLS
9030 SUM=0:PRINT@229,"MACHINE CO
DE ASSEMBLING"
9040 FOR AD=AD TO AD+78
9050 READA$:IF LEN(A$)>2THEN9080
9060 POKE AD,VAL("&H"+A$):SUM=SU
M+PEEK(AD)
9070 NEXT
9080 CLS:READ A$:IF SUM<>VAL("&H
"+A$) THEN PRINT"POSSIBLE ERROR
IN":PRINT"DATA LINE ";DL:PRINT"P
LEASE INVESTIGATE":END
9090 DL=DL+5:IF AD<31989THEN9030
9100 RESTORE
9110 FOR AD=31042 TO 31062
9120 READ A$:IF PEEK(AD)<>VAL("&
H"+A$) THEN CLS:PRINT"POSSIBLE E
RROR IN HEX LOADER":END
9130 NEXT:RESTORE:RETURN
10000 DATA CE,79,18,8E,5,F,CC,1,
0,AF,C1,ED,C1,33,42,11,83,79,3C,
26,F4,7F,79,3D,39,BD,8B,30,FD,79
,3E,17,1,D7,CE,79,18,8E,1,51,CC,
FF,9,A7,80,5A,26,FB,8E,4,21,CC,1
6,17,A1,84,27,F,E1,80,27,B,8C,5,
E0,26,F3,CC,0,1,7E,8C,39,7D,79,3
D,27,E,7A,2018
10005 DATA 79,3D,26,6,CC,0,2,7E,
8C,39,17,0,F6,A6,D4,81,13,26,C,8
E,5,F,AF,C4,8E,1,0,AF,42,20,37,A
6,44,4C,A4,45,A7,44,27,2E,17,0,9
E,B6,79,3C,85,10,26,14,85,4,26,4
,6D,43,26,C,6F,43,17,0,46,24,15,
17,0,E2,24,10,6F,43,6C,43,17,0,4
1,24,7,1668
10010 DATA 17,1,1C,24,2,6F,43,A6
,42,81,19,24,E,33,46,11,83,79,3C
,26,A9,CC,0,3,7E,8C,39,CE,79,18,
A6,42,A7,D4,33,46,11,83,79,3C,26
,F4,17,1,1E,17,FF,32,CC,0,4,7E,8
C,39,B6,79,3C,85,8,26,10,20,9,B6
,79,3C,85,2,26,11,20,A,CC,5,E0,2
0,D,CC,6,18EC
10015 DATA 20,20,8,CC,7,FF,20,3,
CC,8,1,AE,C4,30,85,E6,84,C1,15,2
5,13,A7,84,A6,42,A7,D4,E7,42,17,
1,6,AF,C4,17,1,1,1C,FE,39,1A,1,3
9,FC,79,3E,8D,22,FD,79,40,EC,C4,
8D,1B,10,8E,79,40,7F,79,3C,8D,2,
1F,98,A1,A4,26,3,7C,79,3C,A1,A0,
79,79,3C,79,1F81
10020 DATA 79,3C,39,1F,2,C4,1F,3
4,4,1F,20,84,3,59,49,59,49,59,49
,35,4,39,FC,79,3E,8D,E8,81,8,25,
C,8E,4,3E,C1,10,25,F,8E,4,21,20,
A,8E,5,DE,C1,10,25,3,8E,5,C1,BF,
79,3E,39,10,8E,79,40,C6,20,B6,79
,3C,85,8,26,1,50,86,1,8D,1A,31,2
1,86,FF,18FA
10025 DATA 8D,14,A6,3F,2A,7,6D,A
4,2A,3,1A,1,39,A1,A4,10,25,FF,57
,16,FF,4F,B7,7A,EE,AE,C4,6F,A4,8
6,14,30,88,FF,6C,A4,A1,84,24,5,A
1,85,24,F3,39,6F,A4,6A,A4,39,10,
8E,79,40,C6,1,B6,79,3C,85,2,26,1
,50,86,E0,8D,D2,31,21,86,20,8D,C
C,A6,3F,2A,7,6D,20C0
10030 DATA A4,2A,3,1A,1,39,A1,A4
,10,25,FF,0,16,FF,2,8E,2,0,CC,4,
0,8D,24,C3,0,1,30,1F,26,F7,39,83
,0,20,8D,17,C3,0,1F,8E,0,3,8D,E9
,C3,0,1E,8D,A,CC,4,2,8E,0,6,20,D
C,EC,C4,34,76,34,6,8E,6,0,17,FF,
20,30,85,34,2,C6,FF,3D,30,8B,35,
1974
10035 DATA 2,C6,81,3D,30,8B,35,2
0,A6,A4,C6,C,3D,C3,7B,8B,1F,3,C6
,C,37,2,A7,84,30,88,20,5A,26,F6,
35,F6,BF,BF,BF,AA,BF,BF,BF,BF,95
,BF,BF,BF,80,BF,80,80,80,80,80,8
0,80,80,BF,80,80,BF,80,20,2E,22,
22,3A,2,80,BF,80,80,80,80,8,18,2
8,18,8,80,80,80,2370
10040 DATA 80,80,80,80,10,18,14,
18,10,80,80,80,80,33,C,1E,3F,2D,
2D,3F,1E,C,12,12,12,12,12,12,C,1
E,3F,2D,2D,3F,1E,C,33,9,12,C,3E,
3F,29,2B,3F,1E,C,12,21,24,12,C,1
F,3F,25,35,3F,1E,C,12,21,80,BF,8
0,1E,23,25,29,31,1E,80,BF,80,80,
BF,80,18,28,8,111B
10045 DATA 8,8,1C,80,BF,80,80,BF
,80,1E,21,2,4,8,3F,80,BF,80,80,B
F,80,1E,21,E,1,21,1E,80,BF,80,80
,BF,80,4,8,10,24,3F,4,80,BF,80,8
0,BF,80,3E,20,3E,1,1,3E,80,BF,80
,80,BF,80,1C,20,1E,21,21,1E,80,B
F,80,80,BF,80,3F,1,2,4,8,8,80,BF
,80,80,1AE7
10050 DATA BF,80,1E,21,1E,21,21,
1E,80,BF,80,80,BF,80,1E,21,1E,1,
1,E,80,BF,80,C,1E,1E,3F,2D,3F,3F
,33,12,12,1E,C,80,2C,2A,29,2A,3C
,2A,29,29,29,29,80,80,80,2,4,28,
10,1E,17,13,18,1C,C,80,80,80,80,
80,18,18,80,80,80,80,80,80,80,80
,18,18,24,24,18,1512
10055 DATA 18,80,80,80,80,80,80,
80,80,80,80,80,80,80,80,80,21,21
,33,33,3F,3F,3D,39,3F,1E,1E,C,C,
1E,1E,3F,27,2F,3F,3F,33,33,21,21
,C,1E,32,1B,F,7,7,F,1F,3E,1E,C,C
,1E,13,36,3C,38,38,3C,3E,1F,1F,C
,FF,48,4F,47,52,4F,47,50,52,4F,5
7,20,38,34,FF,1463
10060 REM ----FLEE!-(DRAGONPAC)-
BY:COLIN HOGG AND J-DAVE-ROGERS-
11 CARNARVON ROAD,WALTON,LIVERPO
OL,L91EB.MAY 1985.
```

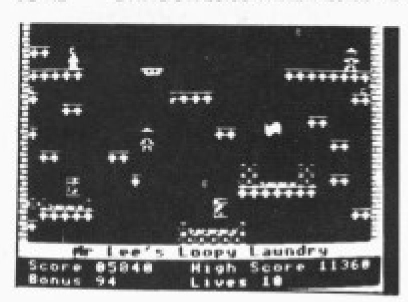
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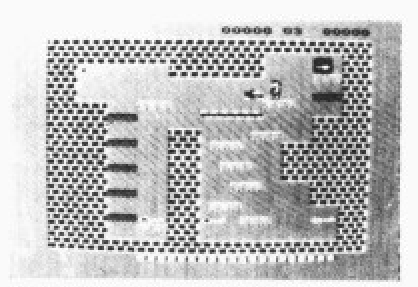
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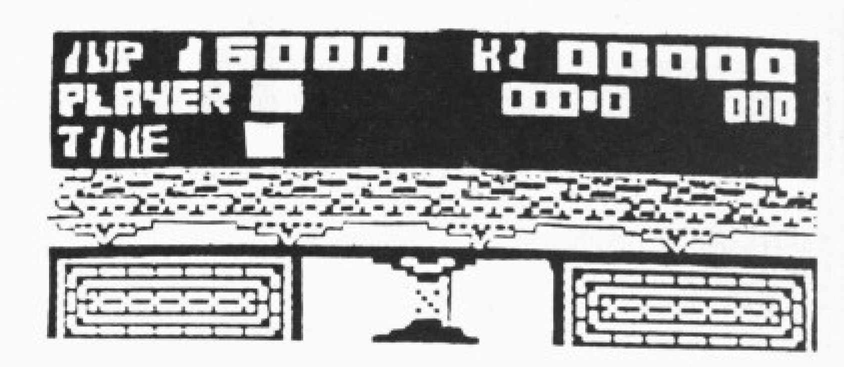
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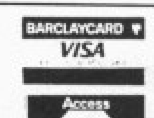
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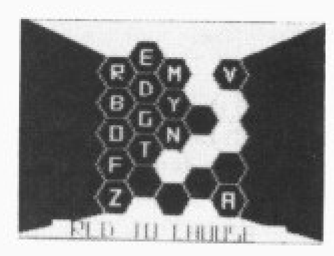
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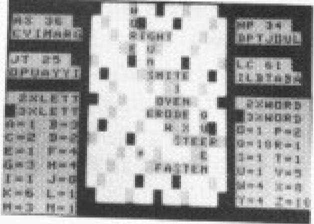


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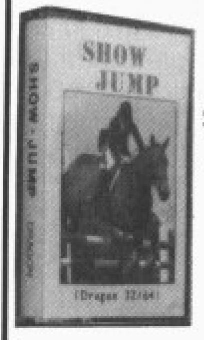


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Machine code for humans

Part One of a massive opus by ***Jason Orbaum et al***

MANY people originally bought a computer "to learn to program", and, after looking at the BASIC manual, gave up and played a few games. Anyone who did that, however, undoubtedly owns a Spectrum, so this series will be aimed at those with a reasonable knowledge of some sort of programming language, but no initial knowledge of the innards of the Dragon, or the 6809E microprocessor at its heart. Hopefully, once we have ambled slowly through the complex pitfalls of assembler programming for a few months, even the most dedicated high-level language programmers will want to give it a try.

We will also be presenting a few complete programs, maybe one or two useful ones among the games! These will be given as complete assembler listings, so they can be used as tutorials, and to this end they will all be fully documented.

The beginning

Before we progress, who are we and why do we feel qualified to teach you? We have been programming in machine code as a team for several years now including, covering the entire range of computers from ZX81s through Dragon and BBC, upwards past IBM and Apricot PC's, to Prime minicomputers. This experience also covers a wide variety of languages, although we rarely use anything but assembler through choice (our experience covers Cobol, BASIC, Pascal, Logo, and C, so we are not just a pair of crazed bit-twiddlers!!). The name Jason Orbaum may ring a bell in the dim recesses of your mind as one of the magazine's reviewing team. If so, then you will know our objectives in program construction, and will also know that we believe that a piece of code is nothing without a firm and workable initial design.

Starting very shortly and running parallel with this series will be a set of articles on the subject of writing adventures in machine code. These should be kept by beginners as they will be invaluable when this course is complete. That series will not attempt to teach machine code, it will, however, provide a fine example of code in use and firm grounding in design beyond the basic techniques of flowcharting we will introduce next month.

Most people think of this sort of programming as machine code, some call it assembler or assembly language, still others call it purgatory, but they are all the same thing (except purgatory that is which is something totally different and much more unpleasant). An assembler is a programming aid for converting a form of the code we can understand, the mnemonics, to a form the computer can understand, the machine code. An assembler is not strictly necessary — for instance, Cosmic Crusader from Blaby Software was written without one — but it will make things infinitely easier, and cut down development time a lot.

Choice of assembler is largely down to personal taste. Most of the programs for this series were written using Encoder09 from Premier Microsystems, now sadly deceased, which uses the standard Dragon BASIC editor. Others are quite acceptable, but it is a good idea to get one that can assemble source files from tape (or disk), as having the source code in memory can take up a lot of space, limiting the size of the final program to a few Kbytes. The Dream editor from Dragon Data is a good example of this, the program in that case being limited to about 5K. All right for small programs, but unsuitable for big projects, although a few of the programs we will be presenting first saw the light of day in a Dream editor/assembler. There is an updated version of Dream, called Diskdream, which is rated by many as the best available, and runs under DragonDos.

Many people write off assembler, dismissing it as difficult to write in, and not worth the effort. It is true that every day there appear faster BASIC compilers, or versions of Pascal that can perform benchmarks 10 per cent quicker, or with 10 per cent less code, but *nothing* will ever beat machine code for speed of execution and compactness of code. Any interpreted or compiled language (machine code is *not* compiled, no matter what the local BASIC expert tells you) must by nature be slightly generalised, and therefore slower and more bulky. With machine code, the programmer has ultimate control over what is produced, and any inefficiency must be down to programmer error or a constraint imposed by the designers of the processor. This also makes assembler one of the most satisfying languages to write in. It is also possible to do anything the computer is capable of in assembler (including blowing the SAM chip — more of that later), whereas most high level languages stick to a standard of one sort or another. The day the International Standards Organisation get at 6809 assembler, we can all buy Commodores and settle down to play games for the duration of our retirement!

Rom calls

Another part of assembler programming is the amount there is to discover about the machine itself. There is a lot of memory used by the system for various purposes, which an assembler programmer can use to make the Dragon sing (literally? Who knows . . .). This can also lead to some particularly spectacular crashes. As most programmers find out very early on in their association with assembler, the reset button is not always the cure — all it is in BASIC.

Machine code is composed of a set of relatively simple instructions, covering simple arithmetic, memory access, and a few hardware functions for interrupts, etc. The 6809E that the Dragon uses is very powerful for an eight-bit processor, much more so than the barbaric 6502, and significantly more so than the reasonably refined Z80. This is due to the fact that, although technically an eight-bit chip, most of its internal structure is that of a 16-bit chip (as opposed to the QL's 68008, which Sinclair call a 32-bit processor, although it is in fact an eight-bit device with ideas above its station). The way processors are defined is basically down to the size of the address bus, which is the part of the chip that carries the address to be operated on. If this is eight bits (BInary digiTS) wide, the maximum address that can be reached is 1111111111111111 binary, or 65535 decimal. This is because the address is sent in two parts, a high byte and a low byte.

Next month we will launch into flowcharting and also describe the internal architecture of the 6809.

Glossary

Address Bus: The address bus is one of the processor's path of communications to the outside world. It is used to transfer addresses to the rest of the hardware, and so the size of the address bus dictates the size of memory the processor can access.
Bit: BInary digiT. As most computer bores will insist on telling you, computers work in binary, or base two, just as humans work in base 10. (Do not, however, let this lead you to believe A› that machine code programmers are limited to using the digits zero and one, or B› that computers possess only two fingers). A bit is therefore either a one or a zero.
Byte: A byte is a number, the maximum value of which is dictated by the computer used. In most cases, a byte is from 0 to 255 (or −127 to 128). This is a function of the memory chips used, rather than the processor, and therefore varies little from machine to machine. A byte consists of eight bits.
Data bus: Similar to the address bus, except that the data bus is used for data.
Nibble: A nibble is four bits, or (cue groan) half a byte. From this last it might be expected to hold any value in the range 0-127. Wrong. A nibble can be in the range 0-15. Look at the definitions for bit and byte, then work it out.

Continued next month

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The Logical Dragon

The elements of an expert system by ***Peter Whittaker***

THE DEBATE over just exactly what 'intelligence' is has gone on for a long time, and as yet there is no sign of an answer in sight. However, computer programmers have not waited for the answer to start exploring the fascinating area of intelligence on computers. Instead, they have decided upon a definition of intelligence which suits them, and then gone on to experiment with it. They say, "If a machine can behave in such a way as to be indistinguishable from a person, and if the person can be said to be intelligent, then so too can the machine." It is from this very practical position that we shall start.

One of the biggest problems computers have in immitating intelligent behaviour is their inability to understand English. They do not of their own accord remember what you tell them, and use the information thus gained to help them to draw new conclusions for themselves. A prime example of this is in the area of syllogisms. Syllogisms are deductive arguments which take the following form:

'A' is a 'B'
'B' is a 'C'
Therefore 'A' is a 'C'.

For example:

Peter is a man.
A man is an animal.
Therefore Peter is an animal

The first two lines are propositions, giving us the raw data to work with, and the third line is the conclusion based upon the first two statements. The conclusion is itself a new fact previously unknown.

I have written this program to handle just such deductive arguments. The program may best be explained by runing it. When the prompt appears, type in the statement *"A student is a layabout"* and press *ENTER*. This is accepted by the program in Line 40 as *A$*. Nothing happens to A$ until Line 120, where any initial 'a/an/the' gets removed. This should bring the subject of the sentence (student) to the front. Then Lines 160-190 remove the verb from the middle of the sentence. This leaves the subject and object standing alone, to be read into *B$* and *C$*. (Line 210 *B$*="student" *C$*="layabout".)

This new information is then stored in an array. Lines 240-280 check to see whether the subject (*B$*) has been encountered before. If it has, then it will be recorded as a heading in the array (Line 260). If it has not been recorded in the array, then it is placed at the top of the first available blank column (Line 250). The program now checks down the column of entries under the subject, to see whether it has already been linked with the object (Lines 290-340). If the object cannot be found, it gets added to the bottom of the list (Line 320). Having stored the data in its array, the program now returns to Line 40 to await the next input. Type in *"Peter is a student"*, and the program will go through the same steps.

Having set up a database with the program, we can now start to examine the information we have stored in it. The first method is to list out the data under subject headings. Type *"Subject"* and when the computer asks which subject, type *"Peter"*. Under this heading we will find the entry "student", and if we had entered *"Student"* we would have found "layabout". The link between the two is obvious to us, but will the computer notice it?

Searching

This brings us onto the second, and more interesting way of questioning the database. Questions asked must be of the form *"Is/Was ***** a/an/the *****"*. Type in *"Is Peter a layabout"*. Once again, this is accepted as *A$* by Line 40, but this time the Is/Was at the start of the question gets detected by Line 90/100 and the program jumps to the question handling routing at Line 360. Here the question is chopped up to extract the subject (*B$*) and the object (*C$*). The program then proceeds to search its database to increasing depths for a link between the two.

The first search is only one level in depth, and the program is not trying to discover new links between various pieces of data, but looking to see whether it already knows the answer. The program scans along the top line of the array trying to find the subject (Lines 480-530). If it cannot find it then the search is terminated, a '*No data*' message is printed, and the program returns to Line 40 to await the next input. If the subject is found, then the program scans down the list of objects listed under the heading trying to find a match for the object in the question. If it finds a match then it prints "YES" and returns to Line 40, otherwise the program moves on to search a level deeper.

The second level search (Lines 590-760) which is the true equivalent of the syllogism argument, starts by finding the subject in the top line of the array, as for the first level search. Then it works its way down the list of objects listed under this heading. However, this time, instead of looking for a match with the sought for object, the program uses each object in the list as a new subject, and searches along the top line of the array to see if there is a column under this new heading. If there is, it then looks down this column searching for a match with the question object. If it finds a match it prints "YES", and copies the new information to the bottom of the subject column, and then returns to Line 40 to await the next input. In this way the program can expand its knowledge database for itself. If it doesn't find a match, it looks up the list stored under the next item in the original subject heading list. This continues until the program has examined all of the items in the subject heading list. If this happens the program moves on to search yet another level deeper.

The third level search (Lines 780-1030) goes one stage further than the usual syllogism argument. (A is B. B is C. C is D. Therefore A is D.) Again it does not immediately look for a match, but uses each item in the subject list as a new heading to search. It then uses the items in the new list again as new headings, and only when it examines items in this third list does the program look for a match with the question object. As with the second level search, when the program finds a match, it updates the information in the original subject list.

The "learning" process of this program can be examined using the 'SUBJECT' command. If we type *"SUBJECT"*, and then answer the prompt with *"ALL"*, the program will list out all of the information stored under each of the subject headings. Under Peter we will find 'student', and under student we will find 'layabout'. Next we ask the computer to find the relationship between the two. Type "Is Peter a Layabout". The program will do a level one search and not find a link. Then it will do a level two search, and find the link (student) between the two terms, and print the answer "YES". If we now examine the database by subject again, under Peter we still find 'student', but we also find the new information 'layabout'.

Deduction

The program has added the result of its deductions to its knowledge base. To help us check up on the program's logic, it also prints out the route it followed to reach it's conclusion. (Peter — Student — Layabout.) Further, the program does not require an exact match to deduce a link. If it can find a partial link it will accept it. (eg, Searching for Man and finding Human will still produce a 'YES' response.)

The LOAD and SAVE options (Lines 1330-1390 and 1250-1310) called by 'LOAD' and 'SAVE' are set up for disc, but can easily be converted to work with tape. They assume that the data file will be called 'SYLLOGY' but this can be easily altered if you are going to convert the program for tape, also delete the error trap at the end of the program. Try experimenting, and see what links your Dragon can deduce between different pieces of information.

```
0 ERROR GOTO 1410
10 CLS:PRINTSTRING$(64,128);:PRINT@
     8,"SYLLOGISM EXPERT";:PRINT@72,
     "BY PETER WHITTAKER":PRINT:PRIN
     T:PRINT"LOAD......LOAD DATA FRO
     M DISC.":PRINT"SAVE......SAVE D
     ATA TO DISC.":PRINT"SUBJECT...E
     XAMINE DATABASE.":PRINT
20 CLEAR15000:DIM ARRAY$(40,40)
30 MAX=40
40 INPUT A$
50 IF A$=""THEN 40
60 IF LEFT$(A$,7)="SUBJECT" THEN 10
     50
70 IF A$="SAVE" THEN 1250
80 IF A$="LOAD" THEN 1330
90 IF LEFT$(A$,3)="IS " THEN 360:'*
     **QUESTION***
100 IF LEFT$(A$,4)="WAS "THEN 370:'
     ***QUESTION***
110 '*** CHOP OFF 'A/AN/THE' ***
120 IF LEFT$(A$,2)="A "THEN A$=RIGH
     T$(A$,LEN(A$)-2):GOTO160
130 IF LEFT$(A$,3)="AN "THEN A$=RIG
     HT$(A$,LEN(A$)-3):GOTO160
140 IF LEFT$(A$,4)="THE "THEN A$=RI
     GHT$(A$,LEN(A$)-4)
150 '*** FIND SUBJECT/OBJECT ***
160 A=INSTR(1,A$," WAS A "):IF A>0T
     HEN B=A+6:GOTO210
170 A=INSTR(1,A$," WAS AN "):IF A>0
     THEN B=A+7:GOTO210
180 A=INSTR(1,A$," IS A "):IF A>0 T
     HEN B=A+5:GOTO210
190 A=INSTR(1,A$," IS AN "):IF A>0
     THEN B=A+6:GOTO210
200 PRINT"SORRY I DO NOT UNDERSTAND
     .":GOTO40
210 B$=LEFT$(A$,A-1):C$=RIGHT$(A$,L
     EN(A$)-B)
220 '*** SAVE DATA IN ARRAY ***
230 A=0
240 A=A+1
250 IF ARRAY$(A,0)=""THEN ARRAY$(A,
     0)=B$:GOTO290
260 IF ARRAY$(A,0)=B$THEN 290
270 IF A=MAX THEN PRINT"OUT OF STOR
     AGE SPACE.":GOTO40
280 GOTO 240
290 B=0
300 B=B+1
310 IF ARRAY$(A,B)=C$THEN PRINT"OKA
     Y.":GOTO40:'***ALREADY SAVED***

320 IF ARRAY$(A,B)=""THEN ARRAY$(A,
     B)=C$:PRINT"OKAY.":GOTO40:'SAVE
      DATA
330 IF B=MAX THEN PRINT"OUT OF STOR
     AGE SPACE.":GOTO40
340 GOTO300
350 '*** DRAW CONCLUSIONS ***
360 A$=RIGHT$(A$,LEN(A$)-3):GOTO390
     :'*** REMOVE 'IS '***
370 A$=RIGHT$(A$,LEN(A$)-4):'***REM
     OVE 'WAS '***
380 '***FIND SUBJECT/OBJECT***
390 IF LEFT$(A$,2)="A "THEN A$=RIGH
     T$(A$,LEN(A$)-2):GOTO420
400 IF LEFT$(A$,3)="AN "THEN A$=RIG
     HT$(A$,LEN(A$)-3):GOTO420
410 IF LEFT$(A$,4)="THE "THEN A$=RI
     GHT$(A$,LEN(A$)-4)
420 A=INSTR(1,A$," A "):B=LEN(A$)-A
     -2
430 IF A=0 THEN A=INSTR(1,A$," AN "
     ):B=LEN(A$)-A-3
440 IF A=0 THEN PRINT"SORRY, BUT I
     DON'T UNDERSTAND.":GOTO40
450 B$=LEFT$(A$,A-1):C$=RIGHT$(A$,B
     )
460 '*** SEARCH DATA ***
470 '*** SEARCH LEVEL 1 ***
480 A=0
490 PRINT"*** SEARCH LEVEL 1 ***"
500 A=A+1
510 IF ARRAY$(A,0)=B$ THEN GOTO 540

520 IF A=MAX THEN PRINT"SORRY BUT I
      HAVE NO DATA.":GOTO40
530 GOTO 500
540 B=0
550 B=B+1
560 IF ARRAY$(A,B)=C$ THEN PRINT"YE
     S.":GOTO40
570 IF B<MAX THEN 550
580 '*** SEARCH LEVEL 2 ***
590 B=0
600 PRINT"*** SEARCH LEVEL 2 ***"
610 B=B+1
620 IF B>MAX THEN 780
630 D$=ARRAY$(A,B)
640 IF D$="" THEN 780
650 C=0
660 C=C+1
670 IF ARRAY$(C,0)=D$THEN 710
680 IF C<MAX THEN 660
690 IF ARRAY$(C,0)="" THEN 610
700 GOTO 610
710 D=0
720 D=D+1
730 IF ARRAY$(C,D)=""THEN 610
740 IF ARRAY$(C,D)=C$THEN PRINT"YES
     !":PRINTB$;" - ";D$;" - ";C$:FO
     R B=1 TO MAX:IF ARRAY$(A,B)=""T
     HEN ARRAY$(A,B)=C$:B=MAX:NEXT:G
     OTO40 ELSE NEXT B:GOTO40:'****
     UPDATE ARRAY****
750 IF D<MAX THEN 720
760 GOTO 610
770 '*** SEARCH LEVEL 3 ***
780 B=0
790 PRINT"*** SEARCH LEVEL 3 ***"
800 B=B+1
810 IF B>MAX THEN PRINT"NO!":GOTO40
```

```
820 D$=ARRAY$(A,B)
830 C=0
840 C=C+1
850 IF C>MAX THEN 800
860 IF ARRAY$(C,0)<>D$ THEN 840
870 D=0
880 D=D+1
890 IF D>MAX THEN 800
900 E$=ARRAY$(C,D):IF E$="" THEN 80
    0
910 E=0
920 E=E+1
930 IF E>MAX THEN 880
940 IF ARRAY$(E,0)="" THEN 880
950 IF ARRAY$(E,0)<>E$ THEN 920
960 F=0
970 F=F+1
980 IF ARRAY$(E,F)=C$ THEN PRINT"YE
    S!":PRINTB$;" - ";D$;" - ";E$;"
     - ";C$:GOTO1020
990 IF F>MAX THEN 880
1000 IF ARRAY$(E,F)="" THEN 880
1010 GOTO 970
1020 FOR B=1 TO MAX:IF ARRAY$(A,B)<
    >"" THEN NEXT ELSE ARRAY$(A,B)=
    C$:B=MAX:NEXT
1030 GOTO40
1040 '***PRINT OUT DATA FILE***
1050 INPUT"WHICH SUBJECT DO YOU WAN
    T TO     CHECK";A$
1060 IF A$="ALL" THEN 1140
1070 FOR A=1 TO MAX
1080 IF ARRAY$(A,0)<>A$ THEN NEXTA:
    PRINT"SORRY I HAVE NO DATA ON "
    ;A$:GOTO40
1090 PRINT"DATA ON ";A$;":-"
1100 FOR B=1 TO MAX
1110 IF ARRAY$(A,B)=""THEN B=MAX:NE
    XT B:A=MAX:NEXTA:PRINT:PRINT"OK
    AY.":GOTO40
1120 PRINTARRAY$(A,B);"  ";:NEXT B:
    A=MAX:NEXT A
1130 PRINT:PRINT"OKAY.":GOTO40
1140 A=0
1150 A=A+1
1160 FOR C=1 TO 500:NEXT C
1170 IF A>MAX THEN 40
1180 IF ARRAY$(A,0)="" THEN PRINT:G
    OTO40
1190 PRINT"*****  ";ARRAY$(A,0);"
     *****"
1200 B=0
1210 B=B+1
1220 IF B>MAX THEN 1150
1230 IF ARRAY$(A,B)<>"" THEN PRINTA
    RRAY$(A,B);"  ";:GOTO1210 ELSE
    PRINT:GOTO1150
1240 '*** SAVE ROUTINE ***
1250 KILL"SYLLOGY.DAT":CLOSE
1260 A=0
1270 FOR B=0 TO MAX
1280 FWRITE"SYLLOGY";ARRAY$(A,B)
1290 NEXT B
1300 A=A+1:IF ARRAY$(A,0)<>"" AND A
    <=MAX THEN 1270
1310 PRINT"FILE SAVED.":GOTO40
1320 '*** LOAD FILE ***
1330 A=0
1350 FOR B=0 TO MAX
1360 FREAD"SYLLOGY";ARRAY$(A,B)
1370 NEXT B
1380 IF EOF("SYLLOGY")=0 THEN A=A+1
    :GOTO1350
1390 CLOSE:PRINT"FILE LOADED.":GOTO
    40
1400 '**** ERROR TRAP ****
1410 IF ERL=1250 THEN 1260
1420 PRINTERR;" ERROR IN LINE ";ERL
```


Roy Coates presents

BEAN STALKER

What about the parts the story tellers couldn't reach? After all, in Giantland, everything was bound to be larger-than-life. Jack would have come across human sized birds and insects as well as giant caterpillars which changed, at will, to and from the butterfly stage in their search for human prey.

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Disk utilities

Program: *Disk Utilities*, Ian Elkington, 11 Wharfedale Gardens, Baildon, Shipley, West Yorks BD17 6TN
Price: £10

DISK UTILITIES is a collection of 12 programs, some of which will be useful to any Dragondos owner. All of the utilities are entered from a main menu which is called up by typing RUN "M". The menu is displayed in a very readable 40 column display and selection is made by moving the cursor line to the required utility and pressing Enter. Most utilities then require you to press enter again, although for no apparent reason.

The first utility is to send a copy of the directory to the printer. I have commented before that this can be done from basic with POKE 111,254:DIR, so the disk space could have been used for a more useful utility here.

A more useful option is 'Disk View'. This allows any sector of the disk to be viewed, using the cursor keys to skip forward or backwards a track or sector at a time. The sector is displayed as ASCII characters at the top of the screen. My only complaint here is that there is no option to dump the sector as HEX codes.

Four separate utilities provided allow programs to be copied from disk to disk, tape to tape, tape to disk and disk to tape. This all sounded very promising until I found that the only files which could be copied of any of the utilities are binary files which load above address 7000. The program will not copy basic or data files. Again, these are potentially very useful utilities, spoilt by inflexibility.

Perhaps the most useful program on the disk is the one which recovers accidentally KILLed files, providing nothing has since been written to the disk. This utility allows any file type to be recovered and gives you the option of Protecting the recovered file.

Another well implemented utility is the Sector Editor. Any sector may be loaded in and edited using the cursor keys. Bytes can be changed either by entering the ASCII character or the ASCII code. The ASCII code of the byte under the cursor is also printed which is essential for identifying non-printing characters. The most common use for the sector editor would probably be to change filenames on the directory track directly (especially useful for null filenames), or, used in conjunction with the 'Disk View' option, to locate the required sector of a program and to change it directly, although this can be potentially fatal.

An option which looked very useful was Disk Menu Creator; this purports to create a menu program on any disk enabling you to load any of the last twelve programs on the disk by a single key press. Unfortunately, all my attempts to use this utility constantly resulted in the program crashing with ?PT error — so much for the 'user friendly prompts'.

The final couple of utilities included allow a complete disk to be saved and loaded from tape. One disk takes about 20 minutes to transfer to or from tape, and as cassettes are cheaper than disks this is an economical way of backing up disks for safety — providing you can stand the wait!

Apart from the few annoying features of this disk, such as not being able to return to the main menu from any of the utilities and the fact that error messages are not explained — DISK ERROR is all you get — this is a genuinely useful set of utilities for disk drive owners. It is a shame that there is no option to use two or more drives, which would save a lot of disk swapping.

Unlike Domino's *Disk Doctor* program reviewed in the September issue of *Dragon User*, there is no utility to automatically recover damaged programs — you'll have to do this manually using the Sector editing option. However, at £10 this offering is considerably less expensive than Dominos.

Brian Cadge



It's war!

Program: *Mail War*, GP Guardians, 18 Fisherbridge Road, Preston, Weymouth, Dorset DT3 6BT

BACK IN the mists of time (when the C5 was just a twinkle somewhere in Sir Clive's anatomy) there was a computer called the ZX-81 for which reviews used to go somewhat like this:

"I cannot review this game as I cannot get it to load due to the bad loading system on the computer. However, it is described by the manufacturer as . . ."

Hey? Guess what? A touch of nostalgia! I can't get *Mail War* to load either. At least not more than once. But that, I'm sad to say, was enough (I'm not actually that sad to say it. It took me three cassette recorders to get *Mail War* to load and now it has given up altogether!).

The game has aspirations to be a play by mail game. It runs in 32K without the need for loading and saving of data except at the end of a game!

This is the equivalent of me saying: "I want to be Rambo! I have a nine-inch chest and can carry three potatoes at a time!"

Play by mail games are big. They have to be, otherwise no one would still be interested in them after having waited two weeks since their last move. This game is not big.

To play this game by mail would also require supreme cassette I/O. The data file workings of the Dragon, especially through I/O, are notoriously bad and to have to save the game after every move would be a nightmare!

When the game did eventually load it was, as I've said, an immense disappointment as it was written, it seems, in BASIC and runs very slowly.

The instructions appear to have been written by someone who has never actually played the game, as in play they were about as useful as the Pac-Man copyright (hello Atari)!

For example: "If a friendly unit occupies the same location as the cursor you will enter 'Control' mode for that unit. The cursor will change from red/green/blue/yellow to red/green/red/red."

The "cursor" described is a pair of pixels set three pixels apart on the PMODE1 screen and the colour change appears to be totally indeterminable! The manual goes on to say how the mathematics of conflict is done by the computer and then tells you what the computer is doing, in case you want to do it on paper.

The game cannot be played solo so both my sister and myself were forced to play this appalling drivel for far too many hours as a test.

Jason Orbaum



It's just a must

Book: *DRAGONDOS Programmer's Guide*, Grosvenor Software, 22 Grosvenor Road, Seaford, East Sussex BN25 2BS
Price: £2.90 inc p&p

IT HAS always been difficult to get detailed information regarding the Dragondos hardware and software — until now that is. Grosvenor Software, better known for their excellent assembler/editor, has released a 12 page booklet entitled *Dragondos — A Programmer's Guide*. The text is not for the beginner, but will be invaluable to the seasoned machine code programmer.

A memory map of the DOS locations used in page six is given (this does not give locations used for commands such as AUTO) as well as all the page zero locations used to store track and sector numbers etc. Very detailed information is given regarding the layout of Directory entries — useful for writing programs to, say, UNKILL a file.

All the entry addresses of useful routines are given, such as READ and WRITE to a file, KILL, PROTECT and RENAME a file. Each routine is clearly documented with entry and exit conditions and there are a couple of useful example programs listed at the end of the booklet.

Finally, there is a short section on known errors in the Dragondos ROM, however this is not as extensive as the article in *Dragon User*, May 1985.

At just £2.90 (inc p&p) this booklet is a must for any Dragondos owner with an assembler.

It is also the perfect size to fit in a Christmas stocking — and will ensure rapt silence over Christmas!

Brian Cadge



Mixing it with Basic

Pam d'Arcy *shows how to pass values between Basic and machine code routines*

THIS IS not exhaustive but seeks to demonstrate, using simple techniques, how to access data commonly between BASIC and machine code routines.

1. Use EXEC

Discard USR in favour of EXEC. This overcomes problems caused by known ROM bugs and techniques used in passing parameters using EXEC would be needed anyway if it is required to pass across more than one officially allowed parameter when using USR.

2. Use EQUATES

Set up the address of machine code routines in variables at the beginning of the BASIC program and use the variable name rather than addresses themselves within the main body of the program.

```
eg.  20 BANG=29314: REM sound of
                          explosion
        :
        :
     200 EXEC BANG
        :
        :
     320 EXEC BANG
```

This is the equivalent of using Equates in machine code with its great attendant advantages:

1) it assists in maintenance such as if the address of the machine code routine is altered, only the easily found line near the beginning of the program needs to be amended, avoiding a hunt through the entire program for every reference to the amended value.

2) it assists in coding accuracy as use of a nominally meaningful NAME or LABEL for strings of digits such as machine code routine addresses is less likely to lead to transposition of characters or miscoding as with numbers alone.

3. Parameters

Whether using USR or EXEC, passing of parameters between BASIC and machine code has the same end result — data is placed by BASIC at a place in memory that the machine code can get hold of in a form that it can use and vice-versa.

4. Parameter storage area using EXEC

Structure machine code routines thus

```
    ENTRY       LBRA PROG
    parameter  )  POKE'd and
    storage    }  PEEK'd by
    area       )  BASIC programs
    PROG
       :
       :
       :
      RTS
```

The first instruction could be a short unconditional Branch if the storage area is less than 128 bytes long but by standardising on the use of a Long Branch, which takes up but one additional byte of memory, you are not limited and so do not have to change it when that odd additional byte of storage added in tips the balance. Perhaps, more importantly, an area of potential confusion is avoided in the BASIC programs if the parameter area always commences at the machine code routine address+3.

5. Dragon numbers

Often a difficult concept to grasp is that although Dragon machine code is very powerful, at its bare bones level, it arithmetically deals only in Whole or Integer numbers, as opposed to fractions. The range of numbers it can deal with in a single instruction is 0 to 65535 if the numbers are only ever positive (known as unsigned numbers) and 0 to +32767 or −1 to −32768 if the numbers may be positive or negative (known as signed numbers). This may seem limited but most home micros can only deal, at this level, with values in the ranges 0 to 255 or 0 to +127, −1 to −128! Larger numbers and fractions are possible by programming techniques, that is, by dealing with the values a byte or two at a time.

Dragon BASIC conforms more truly to many experts' opinions of how a BASIC language should handle numeric values than many other of today's micros' BASICs in that to it, a number is just that, a number. That covers an amazing range of possible values (−999,999,999 to +999,999,999 in whole numbers alone can be printed normally on the screen).

It manages this by holding its numbers, regardless of the value involved, in five bytes of memory in a format variously referred to as Real, Exponential or Floating Point. This enables values in the range 10.14 to the power of plus or minus 38 to be available to BASIC programs before it runs out of puff and gets an 'Overflow' error.

BASIC ROM is after all only machine code. To carry out arithmetic on such numbers requires them to be converted using available machine code instructions to a form that can be handled by the available arithmetic instructions, carry out the arithmetic function and convert them back into their five-byte Real format.

6. Numeric parameters using USR

I have not experimented with them so cannot vouch for any other limitations such as coping with negative values, but it seems that the recommended BASIC ROM routines associated with the USR routine for converting BASIC numerics to a form usable by machine code (INTCNV/GIVABF) copes only with the range of whole numbers 0-65535. (No doubt Brian Cadge's Firmware articles will assist here!) Guidance in using these routines also starts using the word Integer in its usual computer context of meaning a Double-Byte, sometimes called Word, unit of storage (a pair of adjacent memory bytes), rather than the English context as used so far in these pages of Whole number. For clarity, I shall use the words Whole or Double-Byte as appropriate.

7. Numeric parameters using EXEC

Anyone wishing to process fractions or whole numbers outside the bare bones signed or unsigned range in machine code will not find the answer in these paragraphs.

Passing numeric data to machine code

To put the parameters (=data) into the machine code parameter area, POKE is used. POKE deals with a single byte of data at a time, automatically converting the value involved from its internally held five-byte Real format to a single byte providing that no attempt is made to POKE a value other than a whole, positive number not exceeding 255 (else an FC error occurs).

Unsigned single byte parameter

If an unsigned single byte value (0 to 255) is involved, it can be passed across directly such as shown in Fig 1.

Signed single byte parameters

The value range of such a byte is 0 to +127,

−1 to −128. As far as machine code is concerned, it is not bothered about the CONTENTS of a byte. It is the way that we treat it in our coding that determines whether it is being used in a signed or unsigned manner, or even as an ASCII character. To the machine, a byte containing $41 is a byte containing $41. To us, it may be the decimal value 65 or the character 'A' being output to the screen or printer. Similarly, a byte containing $FE is just that to the machine. To us, it represents the unsigned value 254 or the signed value −2 depending on the context.

Thus, when we have a negative number in BASIC to pass across to machine code, adding 256 to it will create the POKEable 'positive' complement.

For example, −2 can be POKEd directly in either of the following ways with identical results:

POKE P1,&HFE
POKE P1,254
POKE P1,256+(−2)

A variable containing a signed value can be suitably dealt with thus: IF N<0 THEN POKE P1,256+N ELSE POKE P1,N

Unsigned double byte parameters

Double byte unsigned values (range 0-65535) need to be POKEd into the parameter area a byte at a time, manipulating the value to ensure that each POKE stays within the 0-255 range. The most significant byte (lower address) of a double byte storage location contains the number of 256s in the value and the least significant byte contains the remainder. This can be easily achieved thus:

POKE P2, INT (N/256):POKE P2+1,(N AND 255)

Use of INTeger lops off any remainder from the division. Dabbling with machine code, the AND 255 can probably be recognised as the equivalent of the machine code logical AND (ANDA/ANDB) #$FF instruction, and neatly isolates the value in the least significant byte of a double byte value. As with single byte negative values, double byte negative values need to be converted to their 'positive' equivalents, this time by adding 65536 to the value. A temporary variable is used (TEMP) for clarity.

IF N<0 THEN TEMP=65536+N ELSE TEMP=N
POKE P2,INT (TEMP/256):POKE P2+1,(TEMP AND 255)

Receiving numeric data from machine code

On return from the machine code routine, the corresponding PEEK process needs to be used.

Single byte numbers N=PEEK (P1)

If the number is signed, add the line IF N>127 THEN N=N−256

Double byte numbers N=PEEK (P2) *256+PEEK (P2+1)

Similarly if the number is signed, add the line IF N>32767 THEN N=N−65536

Figs 1, 2 and 3 (from top)

```
      BASIC                          Machine code routine
                                     starting at address 28000

   40 EA=28000                       ENTRY    LBRA    PROG
   50 P1=EA+3:P2=P1+1                PARAM1   RMB     1
   :                                 PARAM2   RMB     2
   :                                            :
   :                                            :
  320 POKE P1,'value'                PROG       :
       or                                       :
     POKE P1,N                                  :
     (where 'value' is                         RTS
      or N contains
       a positive number
       in the range 0-255)

  330 EXEC EA
```

```
      BASIC                           Machine code at 28000

   40 EA=28000                        ENTRY  LBRA  PROG
   50 PA=EA+3:PB=PA+2                 SSDPTR RMB 2
   :                                  TSDPTR   RMB 2
   :                                           :
   :                                  PROG     :
   90 INPUT "NAME";NAME$                       :
  100 ADDR=VARPTR(NAME$)                      RTS
  110 POKE PA,INT(ADDR/256):
       POKE PA+1,(ADDR AND 255)

  120 EXEC EA
```

```
      BASIC                           Machine code at 28000
   40 EA=28000                             ENTRY    LBRA    PROG
   50 SA=EA+3:SL=SA+2                      SDPTR    RMB     2
                                           SLEN     RMB     1
   :                                         :
   :                                         :
  150 MC$=STRING$(255," ")                 PROG     :
  160 ADDR=VARPTR(MC$)                       :
  170 POKE SA, INT(ADDR/256)                 :
  180 POKE SA+1,(ADDR AND 255)               :
  190 EXEC EA                               RTS
  200 TEMP=PEEK(SL)
  210 MC$=LEFT$(MC$,TEMP)
```

8. String parameters using USR

This appears to be an area particularly affected by ROM bugs.

9. String parameters using EXEC

As with numbers, an understanding of how BASIC deals with strings is necessary if other than simple manipulation is required. Such information is not to be found in these paragraphs.

Locating the string data

Each different variable that the BASIC program encounters while the program is RUNning has a five-byte control area set up for it. For Numeric variables, this control area contains the value itself in its Real format. For String variables, this five-byte area is known as a 'String Descriptor' and it contains four items of information. Two of the items are of special interest when accessing the string in machine code. They are the Length of the string and the Address that the string data actually starts at in memory. The Length is in the first byte (byte 0) of the String Descriptor and the Address is in the third and fourth bytes (bytes 2-3). These values are already in machine code format so need no further conversion to use them within machine code routines.

The first stage in passing string data to machine code is to obtain the memory Address of the String Descriptor for the required string variable. This is acquired using VARPTR.

ADDR=VARPTR (NAME$)

The variable that the address has been placed in, ADDR, is a standard BASIC numeric variable thus is in its five-byte Real format. Its content (ie, the address of the string descriptor) falls into the category of being a whole, unsigned number in the range 0-65535 so can be passed to the machine code routine in the manner previously described: (see Fig 2).

The machine code routine can now locate the string data and its length:

LDX SSDPTR,PC ; get address of NAME$ descriptor into Reg.X

Continued from page 21

```
LDA 0,X     ; get length of NAME$
              into Reg.A
LDY 2,X     ; get address of start of
              actual 'name' into
              Reg.Y
LDB 0,Y     ; get the first letter of the
              'name' into Reg.B
etc.
```

Assemblers equipped to deal with indirect addressing can achieve the same result with fewer instructions. Alternatively, further PEEKs and POKEs in BASIC can extract the Length and Actual String Data Address from the String Descriptor and set it up directly as parameters for the machine code, eg (where P1 and P2 are as in previous examples).

POKE P1,PEEK(ADDR):REM string length
POKE P2,PEEK(ADDR+2):REM most significant byte of actual string address — it doesn't need /256 conversion as it is not a standard BASIC variable but a machine code format double-byte.
POKE P2+1,PEEK(ADDR+3):REM least significant byte of actual string address — doesn't need AND 255 mask etc, as above
EXEC EA

There is no way of doing anything when programming!

Setting up new strings for BASIC from machine code

In BASIC, define a 'target' string variable set up to the length, if known, else maximum possible length, of the string to be set up in the machine code routine.

Depending on how you want to deal with it on its return to BASIC, if it is a variable length string, fill it with space characters or recognisable 'end of string' characters, eg MCODE$=STRING$(255,"*").

Obtain the string variable's descriptor address, pass it across to the machine code routine, set up the actual string data and return to the BASIC program. The string is then available for instant use in BASIC.

Adjusting variable length strings

If a shorter than maximum length string has been set up, it seems that no harm will come in physically amending the Length byte in the String Descriptor to the new actual, shorter, length.

However, to err on the side of caution in the early stages is sensible, so get BASIC to adjust the string length itself in one of two ways — either pass back to the BASIC as a separate numeric parameter the actual length of the string as set up in the machine code or indicate the end of the string of data with an arbitrary 'end of string' marker byte as is most convenient from the programming point of view. BASIC can then adjust the string length accordingly thus:

1) Using a Length parameter (see Fig 3).
2) Using String End Marker

As above except to initially fill the string with what will be the end of string marker, eg MC$=STRING$(255,"#")

On return to BASIC, the MC$ length can be adjusted thus:

```
200 TEMP=INSTR(1,MC$,"#")
210 IF TEMP>0 THEN MC$=LEFT$
(MC$,TEMP)
```

(If TEMP was 0 no 'end of string' marker was found so the string was filled to its currently set maximum thus needs no adjustment.)

10. Relative parameter addressing

Give Label names to the parameter fields in the machine code area and refer to the fields by Label within the code. This greatly reduces maintenance if fields are altered as re-assembly automatically adjusts the addresses, avoiding searches for references to fields where there may be a knock-on effect.

Similarly, define the addresses of the parameters in variables at the beginning of the BASIC program 'relative' to the previous one as in the small examples above. Should, say, the size of a parameter near the beginning of the area be changed, a whole list of addresses do not have to be amended, for example:

```
40 EA=28000
50 P1=EA+3
   P2=P1+2
   P3=P2+1
   P4=P3+2
```

This shows that P2 starts at the address two bytes after P1; P3 starts one byte after P2 etc.

Should the length of P1 be reduced to one byte, using this 'relative' method of addressing, only the P2 statement needs to be altered (to P2=P1+1) and the other addresses will be automatically computed correctly saving much potential maintenance.

The fewer the opportunities of making errors, the better!

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Firmware

Brian Cadge explores the Dragon's ROM in a special series which builds up month by month into a firmware manual.

This month we look at the Miscellaneous Firmware locations and routines. These are those not already covered which do not fall into any particular category, but which may be of use.

Miscellaneous Firmware Data Locations

25/26	Start address of Basic program.
33/34	Address of top of machine stack.
39/40	Top of Firmware RAM.
41/42	Line number used in CONTinue command.
43/44	Temporary general purpose line number store.
47/48	Direct mode command text pointer
104/105	Current line number (65535 in direct mode).
116/117	Physical end of RAM.
138/139	General purpose 16 bit scratch pad.
157/158	EXECute entry address (initially points to routine giving an ?FC error on power up).
166/167	Address of current significant byte of current command.
175	TRON/TROFF flag — non-zero=trace on.
176/177	Address of start of USR address table.
207/208	RENUMber increment value.
209/210	RENUMber start line number value.
211/212	CLOADM 2's complement load offset value.
213/214	RENUMber new start line value.
215	Editor line length — not user available.
274/275	Current value of system TIMER.
277-281	Random number seeds used for RND function.
288	Number of Basic commands.
289/290	Address of list of Basic commands.
291/292	Address of command despatch table.
293	Number of Basic functions.
294/295	Address of list of Basic functions.
296/297	Address of function despatch table.
298	Number of disk commands.
299/300	Address of list of disk commands.
301/302	Address of disk command despatch routine.
303	Number of disk functions.
304/305	Address of list of disk functions.
306/307	Address of disk function despatch routine.
346	Value of Joystick (0)
347	Value of Joystick (1)
348	Value of Joystick (2)
349	Value of Joystick (3)

Miscellaneous firmware Routines

SysErr — (Dragon 33604, Tandy 44102)
This routine generates the appropriate action for an error code in the B register. The routine resets the stack, turns the cassette motor and audio off and returns to the Basic command mode. Errors should always be caused by entering this routine, even it it is patched by the DOS via the System Error Trap link. Error numbers start at zero which is an NF error, and go up to 52 in steps of 2. DOS errors start at 128 and go up to 166 in steps of two. The error codes are in the following order; NF, SN, RG, OD, FC, OV, OM, UL, BS, DD, /O, ID, TM, OS, LS, ST, CN, UF, FD, AO, DN, IO, FM, NO, IE, DS, NE.

CmdMode — (Dragon 33649, Tandy 44147)
Prints the "OK" prompt and returns to the command mode, all return addresses, and subsequent commands on a multi-statement line are lost.

BasVect1 — (Dragon 33823, Tandy 44321)
Sets up various necessary vectors one a Basic program has been loaded. It should be followed by a call to BasVect2.

BasVect2 — (Dragon 33773, Tandy 44271)
Completes the initialisation process after a Basic program has been loaded. It should lbe preceded by a call to BasVect1.

Reset Stack — (Dragon 33844, Tandy 44339)
Resets the Basic stack to its initial position, all entries are lost. This routine is used as part of the power-up and error recovery procedures.

NEW basic — (Dragon 33815, Tandy 44313)
Removes the current basic program from memory (if any), resets the basic stack, clears all variables. This routine has exactly the same effect as the NEW command in basic.

RUN Basic — (Dragon 33951, Tandy 44446)
Runs a basic program in memory. This routine is most often used to autorun basic programs after loading them from tape or disk and calling BasVect1 and BasVect2. This routine cannot be called directly from Basic.

Random Number — (Dragon 38798)
Generates an 8 bit random number and places it in location 278.

RESET — (Dragon 46004, Tandy 40999)
Resets the whole machine as if the RESET button had been pressed. The basic program and variables are not effected.

Boot Basic — (Dragon 46080, Tandy 41142)
Restarts the Basic interpreter as if the machine had just been powered up and reset. This has the effect of NEWing any program in store and displays the normal sign on message.

Read Joysticks — (Dragon 48466, Tandy 43486)
Updates all the joystick data locations — stored in 346-349.

List Basic — (Dragon 36522, Tandy 46948)
List the Basic program in memory to the Device whose device number is in DEVN (location 111). The *A* register must be zero on entry. This routine can not be called directly from Basic.

Boot Basic64k — (Dragon 48000)
Boots up the 64k version of Basic and goes into RAM mode. The complete routine only exists in the Dragon 64's ROM. A small section of machine code is copied into the cassette buffer. This selects an alternative on board ROM which contains the 64k basic. This is copied into RAM at 49152 onwards and the new basic is entered. Programs are preserved, variables are cleared.

Reset D/A — (Dragon 47828, Tandy 43397)
Puts the value $7E into the D/A convertor address.

Write D/A — (Dragon 47830, Tandy 43399)
The A register on entry must contain the data to be placed in the D/A convertor, Bits 0 and 1 should be clear.

Select JSK — (Dragon 48449, Tandy 43426)
Selects the joystick sources (ports 0,1,2,3) from the A register on entry. This routine writes to CA1 and CA2.

This is the seventh in Brian's series on the Dragon Rom routines. Next month, he will be covering the area of DragonDos Firmware. If you have missed any of the previous issues, they can be obtained from Dragon User, Back Issues, 12-13 Little Newport Street, London WC2H 7PP, at £1.25 each, inclusive of postage, packing and administration charges. Just to remind you of the previous months:
Sept 85 — Cassette Operating System
Oct 85 — COS Firmware Routines
Nov 85 — Text Manager Routines
Dec 85 — Graphics and Sound
Jan 86 — Variables
Feb 86 — Assorted Vectors

Cupid Cupid

More machine code action for the keyboard of **Steve Gathercoe**

THIS GAME is all about Cupid. He has to get his practice so first of all you must shoot your arrows at the moving targets using the *Enter* key. This is not too bad as Cupid does not move on this first level, but once you have shot 10 arrows you move on to level 2. In this level, Cupid's little wings are getting tired and he keeps falling to the bottom of the screen. You must press the up arrow key to stop him falling and ending the game, but don't go up too high or the game will finish.

After another 10 arrows you move to level 3 where a man and woman appear at the top of the screen. This time instead of a target you will have to hit little hearts — if you hit one then the man will move closer to the woman. The game ends when the man meets the woman or you use 10 arrows.

For each hit of the target you will score higher for the next hit, depending on where you hit the target, in other words a bull on the first hit will get you more for the next hit on the target. Your hit is also indicated on a large target at the top of the screen. A simple hall of fame at the end of the game will show your relative score position.

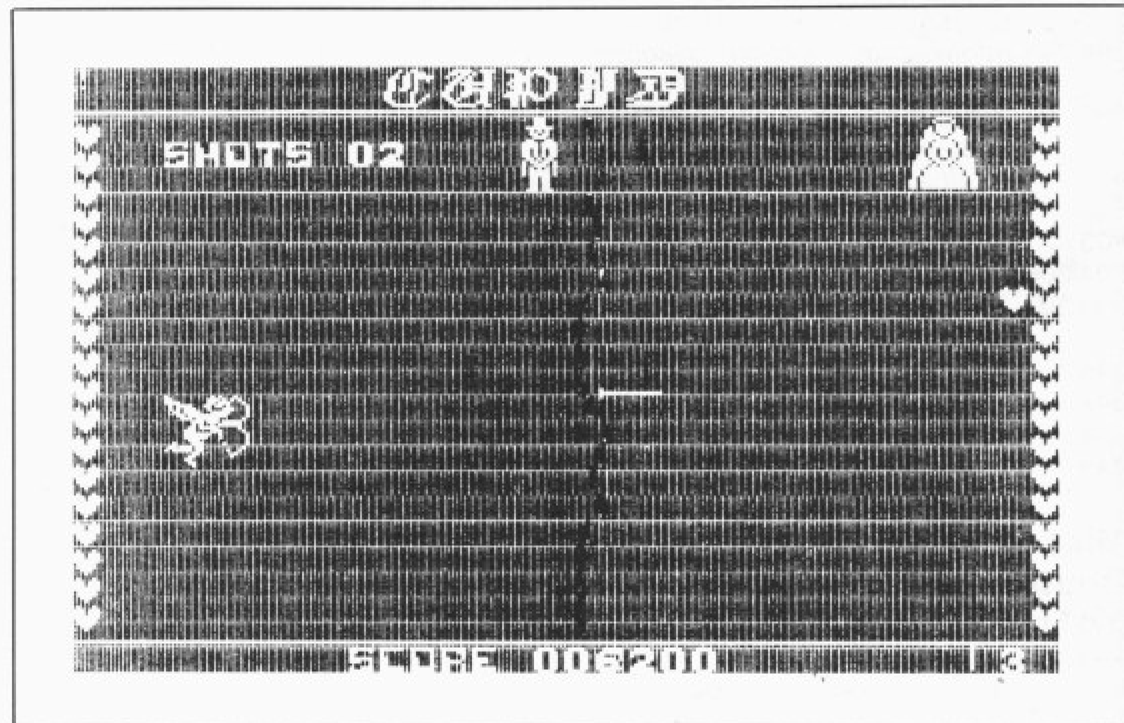
To type in the game proceed as follows. First type in Listing 1, the hexloader. It is the same as my previous loaders so use it again if you already have it on tape. Run it and you will be asked for the start address (28000). Type this in and *Enter*. You will then be asked for the finish address (30988). Type *this* in, then *Enter*.

Now you must type in the row of hex digits up to, but not including, the '=' sign from Listing 2. Press *Enter* and then type in the checksum (this is the number after the '=' sign). Press *Enter* and if all is okay you will see the next address displayed and you carry on as before until the whole of Listing 2 is finished. If you want to type in the listing in small sections, then type in the finish address you want to finish at then save this using *CSAVEM "CUPID",28000,n,28000,* where 'n' is the address you finished at. Next time you carry on, the start address will be the finish address you used last time — don't forget to *CLOADM* each part before restarting each time, though.

The whole game is saved using *CLOADM "CUPID" ,28000,30988,28000,* then once loaded use *EXEC 28000* to start. If the game is too much to type in then I will supply a copy for £1.50. Also if you need any help or advice, then don't hesitate to contact me at 16 Hankinsons Estate, Walpole St Andrew, Wisbech, Cambs PE14 7NA. Happy St Valentine's!

```
10 CLS
20 REM HEXLOADER - ENTER THE
30 REM STRING OF HEX DIGITS FIRTS
40 REM AND THEN THE CHECKSUM
50 CLEAR 200,27999
60 PRINT"ENTER START ADDRESS";:INP
UT START
70 PRINT"ENTER FINISH ADDRESS";:IN
PUT FINISH
80 FOR N=START TO FINISH STEP 11
90 PRINTN;":";
100 TT=0:INPUT A$:Z=0
110 FOR G=1 TO LEN(A$) STEP 2
120 P=VAL("&H"+MID$(A$,G,2))
130 TT=TT+P:POKE (N+Z),P
140 Z=Z+1:NEXT
150 PRINT" = ";
160 INPUT T$
170 IF T$ <>HEX$(TT) THEN SOUND 20
,30:PRINT"ERROR - ENTER LINE AGAIN
":GOTO 100
180 NEXT
```

Listing 1



LISTING 2

```
28000 1608590000000000000000 = 77
28011 0000000000000000000000 = 0
28022 0000000000000000000000 = 0
28033 0000000000000000000000 = 0
28044 0000000000000000000000 = 0
28055 0000000000000000000000 = 0
28066 0000000000000000000000 = 0
28077 0000000000000000000000 = 0
28088 0000000000000000000000 = 0
28099 0000000000000000000000 = 0
28110 00000098012E036F86690 = 39F
28121 668066806C806080608860 = 4E0
28132 9030A01FC03E786D309A30 = 45C
28143 36306FF0C630C7F0C730C6 = 62F
28154 30683030701F98E5C036E0 = 4DA
28165 3C387C18B418741834187F = 32B
28176 18F59034E0340034001CF0 = 425
28187 0EE00EE00EE00EE01EE00E = 4C4
28198 E00EE00EE00EE008E01FC0 = 571
28209 FFE07FF001183D1819F819 = 4E6
28220 1819F819183118C1183FF0 = 3AB
28231 FFE0800A20C01D50F01B88 = 549
28242 5E36845711C4378F841BFF = 4A8
28253 040EFC0801DDF0014BF003 = 423
28264 7C10070E0807F20407E204 = 293
28275 03800421C1046EC008BEC0 = 421
28286 9001802003004006000003 = 17D
28297 0000010000000A20021D50 = 9A
28308 071B880736840F11C41B8F = 2F9
28319 8437FF045AFC08B9DDF0D1 = 673
28330 4BF0C37C10070E0807F204 = 3A4
28341 07E20403800421C1046EC0 = 388
28352 08BEC09001802003004006 = 300
28363 000003000001000FCC480 = 244
28374 FCE4049CFCFC8080C0C0C0 = 7B8
28385 FCFCFC8484C4C4C4FCFCFC = 93C
28396 8C84C4F8C4C4C4FC8080F0 = 804
28407 F0C0FCFC0044EEEEFE7C7C = 7BE
28418 38108000FFFF8000040C1C = 372
28429 2C2C2C6C6CACACC8F0FCF0 = 658
28440 C8ACAC6C6C2C2C1C0C0478 = 3F4
28451 CCCCCCCCCCCC783070B030 = 6C0
28462 303030FC78FC8C0C3870FC = 53C
28473 FC78CC8C38388CCC788080 = 60C
28484 9090FCFC1010FCFCC0F8FC = 7E4
28495 0CFCF83C7CC0F8FCCCFC78 = 7AC
28506 FCFC0C0C183070E078CCCC = 5B8
28517 78CCCCCC7878FCCCFC7C0C = 718
28528 FCF800FF0003FFC00783E0 = 61F
28539 0E3C701CFF3839FF9C73FF = 553
28550 CE7781EEF73CE7E77EF7EF = 819
28561 7EF7EF7EF7EF7EF7EF7EF7 = 8A1
28572 EF7EE7E73CEF7781EF73FF = 7BF
28583 CE39FF9C1CFF380E3C7007 = 4B6
28594 C1E003FFC000FF00DF8F07 = 5D7
28605 8FDFFCC480FCE4049CFC8C = 7B6
28616 8CCCCCFCC4C4C4FC8484C4 = 834
28627 C4C4FCFCFCFC1010303030 = 628
28638 30FCC480FCE4049CFC00E0 = 6CC
28649 00E000E003F8015001B000 = 3BD
28660 E0031807BC07BC06AC06AC = 3E5
28671 06AC035805B404E4055405 = 30C
28682 F405F401B001B001B001B0 = 4B1
28693 03B801E00002100001E000 = 28F
28704 05E8000DEC000EDC000F3E = 31D
28715 001DEE001BF6001BF60016 = 343
28726 DA0016DB0036DB003B3780 = 3CE
28737 7DEF807AD78077FB806FFD = 71B
28748 806FFD805FFEC0DFFEC0DF = 805
28759 FEC0DFFEC0000000000000 = 45B
28770 0000000000000000000000 = 0
28781 00000000000003436BE70 = 198
28792 6B10BE6D7E10BF706EBF70 = 500
28803 6E35B63436BE7068BF706B = 4F3
28814 35B63436BE7065BF706835 = 4B4
28825 B63436BE7062BF706535B6 = 52F
28836 3436BE705FBF706235B634 = 4A7
28847 3610BE706E8E05AB9F8817 = 45E
28858 003E10BE706B8E056B9F88 = 40C
28869 17003210BE70688E052B9F = 34C
28880 8817002610BE70658E04EB = 3E5
28891 9F8817001A10BE70628E04 = 38A
28902 AB9F8817000E10BE705F8E = 422
28913 046B9F8817000235B63436 = 304
28924 0F6F1F20BD957A35B63436 = 3DE
28935 C60ABE6DCA3001BF6DCA5A = 546
28946 26F58E1D13108E6D78A6A4 = 4A6
28957 4C810A2713A7A4C6083DC3 = 42A
28968 6F221F028608C61F170085 = 2C1
28979 35B64FA7A43420C6083DC3 = 4A7
28990 6F221F028608C61F17006F = 2AB
29001 35203121301F8C1D0D26C7 = 299
29012 35B63436B6FF238A08B7FF = 575
29023 238E000186FDB7FF208D16 = 4AE
29034 7FFF208D1130018C003F25 = 35D
29045 EDB6FF2384F7B7FF2335B6 = 704
29056 1F12313F26FC393436B6FF = 41B
29067 238A08B7FF238E000186FD = 4A0
29078 B7FF208D167FFF208D1130 = 4E5
29089 018C00FE25EDB6FF2384F7 = 5F0
29100 B7FF2335B61F12313F22FC = 483
29111 393436A7E2A6A0A7803A6A = 53D
29122 E426F7326135B63476A7E2 = 5B2
29133 EEA1EF813A6AE426F73261 = 637
29144 35F63476A7E2EEA1EF81A6 = 703
29155 A0A7803A6AE426F3326135 = 530
29166 F63436BE6D76301F8C0000 = 3DC
29177 26F935B6343613BE6D6610 = 428
29188 8E6D7E8617C61F17FFAA30 = 4EB
```

```
29199 8820BF6D66B66D6D810326 = 474
29210 08108E6EFB86092006108E = 362
29221 6F0A861717FF8C8C192125 = 3A3
29232 0D108E6D7E17FF808E07FE = 4BF
29243 BF6D6635B63436B66D6A81 = 4F5
29254 01274D8E090AB66D694CB7 = 3A5
29265 6D69810A26188601B76D6E = 3B8
29276 8608C61F8E090A108E6F22 = 343
29287 17FF4E86018E0909C6083D = 396
29298 C36F221F028608C61F17FF = 3FE
29309 3A17FED5BE6D6330890103 = 46F
29320 BF6D6F108E6F048603C61E = 419
29331 17FF3335B63436B66D6A81 = 4AC
29342 002745C60386041CFEBE6D = 404
29353 6F8D3C30018D3830018D34 = 320
29364 4A26EEBE6D6F308820BF6D = 4FC
29375 6F5A26E03088A0BF6D6FF6 = 5B8
29386 6D6C5AF76D6C2614C602F7 = 4FC
29397 6D6CBE6D6F3001BF6D6FB6 = 4F5
29408 6D724CB76D7235B63436E6 = 4FC
29419 8456E78435B63436B66D72 = 52F
29430 81172540B66D69810A2616 = 350
29441 B66D6D810326058601B76D = 3EA
29452 6B170238B66D6D4CB76D6D = 429
29463 4FB76D72B76D6ABE6D6F30 = 53D
29474 88E1A684810027028D10BE = 498
29485 6D6F108E6D7E8603C61E17 = 3E9
29496 FE8F35B63436F66D6DC103 = 576
29507 102700F2C104102700EC17 = 328
29518 FE06811D222B10BE6D7417 = 3B5
29529 FDAA313F108C000026F510 = 3DE
29540 BE6D74312110BF6D748E08 = 437
29551 2EF66D6DC103102700C017 = 3D0
29562 013D16009C81AC222D10BE = 33A
29573 6D7417FD7B17FD78313F10 = 47C
29584 8C000026F210BE6D743123 = 3A7
29595 10BF6D748E08AEF66D6DC1 = 585
29606 031027008E17010B206B81 = 1F7
29617 E6223010BE6D7417FD4A17 = 45C
29628 FD4717FD44313F108C0000 = 3A8
29639 26EF10BE6D74312410BF6D = 455
29650 748E092EF66D6DC1031027 = 404
29661 005A1700D7203710BE6D74 = 34E
29672 17FD1A17FD1717FD1417FD = 495
29683 1117FD0E17FD0B313F108C = 35E
29694 000026E910BE6D74312510 = 324
29705 BF6D748E094EF66D6DC103 = 519
29716 1027002117009E17FDD117 = 309
29727 FDCE108E6D7EBE6D66301E = 533
29738 8618C61D17FDA98E07FEBF = 590
29749 6D6635B617FD1A10BE6D74 = 49B
29760 17FCC2313F108C000026F5 = 3FC
29771 10BE6D74312210BF6D7417 = 3C9
29782 FD2FBE6DCD108E6D7E8618 = 54B
29793 C61E17FD633002BF6DCD10 = 496
29804 8E6FE717FD57C603F76D6D = 5E9
29815 8C081923058601B76D6B20 = 30B
29826 9834368E080D108E6D7E86 = 3B4
29837 18C61D17FD4717FCC017FC = 53C
29848 6C26FBBE6DCD108E6FE786 = 5FF
29859 18C61E17FD20108E7017BE = 413
29870 6DCF8618C61D17FD2335B6 = 4DF
29881 3436B66D6D8103272CC604 = 39B
29892 3404108E6FBA8605C61F17 = 386
29903 FCE71700DA34108E080D10 = 3CB
29914 8E6F728618C61D17FCF617 = 510
29925 00C7351035045A26D635B6 = 386
29936 3436BE6D76301F8C000026 = 30C
29947 F935B63436B66D6D810127 = 487
29958 13867FB7015186FFB70155 = 4B3
29969 BD8006815E2602201713BE = 352
29980 6D63108E6D7E8617C61D17 = 3F0
29991 FCB1308820BF6D6335B613 = 512
30002 BE6D63108E6D7E8617C61D = 497
30013 17FC9A3088E0BF6D6335B6 = 5BF
30024 34368E028ABF6D76C60586 = 477
30035 E8B7FF2217005486F8B7FF = 65F
30046 2217004C17FC225A26EA10 = 334
30057 8E6F228E09098608C61F17 = 349
30068 FC42300117FC3D4FB76D69 = 49B
30079 8E1D1E108E6F328608C61F = 37B
30090 17FC2B4FB76D6EB66D6D81 = 530
30101 02261417FBBB17FEE58E1D = 4AE
30112 1E108E6F3A8608C61F17FC = 3EB
30123 0C35B634368E4E20301F8C = 338
30134 000026F935B686F5B7FFC3 = 5FE
30145 B7FFC5B7FFC7B6FF228407 = 75A
30156 8AF8B7FF228E06004FA780 = 564
30167 8C1E0026F88E062A108E6D = 391
30178 D1860CC61E17FBDF31A818 = 529
30189 3002108C6E4925EE8E07C0 = 3ED
30200 86FFA7808C07E026F78E1C = 5E6
30211 C086FFA7808C1CE026F78E = 69F
30222 1D09108E6ED38608C61F17 = 38F
30233 FB9D31283001108C6EFB25 = 44C
30244 EF8E1D0F108E6F228608C6 = 42C
30255 1F17FB8530018C1D1526EE = 3B9
30266 C6088E1CFD8680A7843088 = 55E
30277 205A26F6108E6F2A8E1D1E = 396
30288 8608C61F17FB61108E6EFB = 4ED
30299 8E08208609C61F17FB5330 = 3BF
30310 8901208C1BA025F08E083F = 3DB
30321 17FB44308901208C1BBF25 = 3BB
30332 F48E080D108E6F728618C6 = 47A
30343 1D17FB4F8E0903108E6FBF = 3E4
30354 8608C61F17FB1F31283001 = 32E
30365 108C6FE725F3108E6F228E = 4C7
30376 090917FB0B300117FB068E = 306
30387 12A3BF6D638E07FEBF6D66 = 569
30398 4FB76DCAB76DCBC608108E = 598
30409 6D784FA7A05A26FBB76D6A = 584
30420 B76D6EB76D6BB76D72B76D = 5DB
```

```
30431 69C602F76D6C8601B76D6D = 519
30442 8E6D744FA7808601A7848E = 525
30453 07D0BF6D768E081BBF6DCF = 525
30464 8E080CBF6DCD170202B66D = 3D9
30475 6B81011027008C17FBDCB6 = 454
30486 6D6B810110270080B66D6D = 3A1
30497 8101271017FDD6BE6D638C = 4BD
30508 0B2D256E8C19A02269B66D = 3BE
30519 6B81012762BE6D63108E6E = 410
30530 8E8617C61D17FA9017FAA2 = 562
30541 17FAADBD8006810D260817 = 3D4
30552 FAE68601B76D6A8103273B = 4DB
30563 17FB3217FB88B66D6B8101 = 4EE
30574 272E8617108E6E4917FA61 = 3B9
30585 17FA7317FA7E17FB1617FB = 54D
30596 6CB66D6B81012712BD8006 = 3F8
30607 810D260817FAAA8601B76D = 422
30618 6A16FF6B17016A8601B7FF = 4A9
30629 22867EB7FFC3B7FFC5B7FF = 7D0
30640 C78E04008660A7808C0600 = 3F8
30651 26F98E04688671A7843088 = 4F3
30662 404C817726F68E0469C606 = 467
30673 866EA7843088405A26F88E = 51D
30684 040C108E78D7A6A0A78010 = 47A
30695 8C78DC26F68E0425108E78 = 4C9
30706 DCA6A0A780108C78EF26F6 = 668
30717 BE6DCABC705F251D17F86C = 53D
30728 17F87B17F88217F88917F8 = 5C2
30739 90BF705F108E046B10BF70 = 46A
30750 7116007ABC7062251A17F8 = 3DD
30761 4A17F85917F86017F867BF = 556
30772 7062108E04AB10BF707116 = 3E5
30783 005BBC7065102500171 7F8 = 347
30794 2917F83817F83FBF706510 = 462
30805 8E04EB10BF707116003DBC = 43C
30816 7068251317F80D17F81CBF = 416
30827 7068108E052A10BF707120 = 375
30838 25BC706B251017F7F5BF70 = 523
30849 6B108E056B10BF70712010 = 359
30860 BC706E250B108E05AB10BF = 3E7
30871 7071BF706E17F80F8E05E7 = 516
30882 108E78C7A6A0A780108C78 = 55E
30893 D726F6BD800681591027FD = 544
30904 03814E1027003017003217 = 199
30915 FC2B20E9414E4F54484552 = 441
30926 60474F6068596F4E690315 = 355
30937 1009040219201314051605 = 9F
30948 2007011408051203 0F0C05 = 7E
30959 8E04009F883436BE7071C6 = 488
30970 0A301DA6848840A7805A26 = 3F0
30981 F717F87E35B63939FFFFFF = 6DE
```


SHAOLIN MASTER

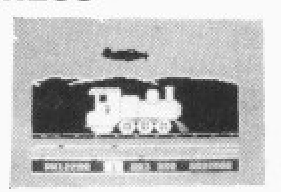


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Royalties paid for machine code DRAGON software

Dream Patch

I RECENTLY purchased a Dragon 64 and was dissapointed to find that the "Alldream" assembler will not work in 64 mode.

Is there any way of patching this program to make use of the extra memory?

G Turner
3 Alder Lane
Crank
St Helens
Lancs

IT IS not possible to "patch" Alldream to use the extra RAM. However, the solution I use is to copy the Basic into RAM using the program below. This then allows you to use the RAM from 49152 to 65280 for object code and data. The program also copies the first 8k of the cartridge area in case DOS is present, in which case you can use RAM from 57344 onwards.

```
      ORCC   #16
      LDX    #32768
LOOP  STA    $FFDE
      LDD    ,X
      STA    $FFDF
      STD    ,X++
      CMPX   #57344
      BLO    LOOP
      ANDCC  #239
      RTS
```

Memory Port

I WONDER if you can help me. I have a cartridge I no longer require. I am wondering it if is possible to remove the EPROM in the cartridge and replace it with a RAM chip. If this is possible please could you recommend a RAM chip. Also would I need special software to access this RAM?

D Black
13 Buckingham Road
Belmont
Durham
DH12 2BD

ALTHOUGH it is certainly possible to add extra RAM to your Dragon via the cartridge port, it is not usually possible to simply replace the Eprom with a RAM chip. The types of Eprom used in Dragon and Coco cartridges also varies so it is not easy to recommend a way of "piggy-backing" RAM chips.



The cheapest solution requires a little hardware knowledge, but a minimal of components — just a prototyping cartridge, RAM chip and Address decoder. The RAM would simply be accessed directly from address 49152 onwards.

Breaker Break

EVERYONE talks about the famous POKEs to disable the BREAK key, but personally I have never come across them. Could you please tell me?

Craig Henderson
39 Woodbury Avenue
Somerset
BA5 2XW

THERE ARE two ways to disable the BREAK key. The first consists of a few pokes to the DOS vectors and does not disable BREAK in INPUT statements — limiting you to using INKEY$. The second method which I favour is rather longer, but works in all situations that I know of. Simply add the lines listed below to the start of your programs.

```
5 'DISABLE BREAK KEY (INC INPUT
LINES)
10 CLEAR200,32550
20 FORI=0 TO 55:READA$:POKE 3255
1+I,VAL("&H"+A$):NEXT
30 DATA 8E,7F,3C,BF,01,6B,8E,7F,
54,BF,01,9B,86,7E,B7,01,6A,B7,01
,9A,39,0D,6F,27,01,39,32,62,34,1
4,BD,80,09,BD,80,06,27,F8,81,03,
27,F4,7E,B5,42,9F,DF,35,10,30,04
,34,10,9E,DF,39
40 EXEC 32551
```

Shacking

I RECENTLY purchased a Radio Shack TP-10 Thermal Printer as a companion for my Dragon 64, specifically for the printing of listings. I assumed compatibility would not be a problem, as it was designed for the Tandy MC-10 and TRS 8 Colour Computer.

I had no trouble in making up a 4-pin DIN to 7-pin DIN cable, with only Data, Status, and Ground connections necessary on each plug. However I now have my doubts, because after POKING 1023,1 for the serial port access, the only print-out that I can achieve is a solid block, determined in length by the input string! Direct instruction by Print#-2,CHR$(N) also gave the same single block print-out.

Nigel S Woodberry
79 Worston Lane
Burnham-on-Sea
Somerset
TA8 1LZ

I CAN'T see any problem in interfacing this printer with the Dragon 64 as you describe. I think the problem you are having is due to the baud rate being incorrect. The Coco powers up with a default rate of 600 baud for its serial port, and so most Tandy printers expect serial input to be at this speed. The Dragon 64 powers up with a default rate of 1200 baud. I suggest you try the following, which will set the RS232 port to 600 baud and select it:
POKE &HFF07,(PEEK(&HFF07) AND &F0) OR 7:POKE 1023,1

High Speed

RECENTLY, I've extended my Dragon from a 32 to a 64 machine. While working in the 64 mode, a problem arose; POKE 65495,0 which speeds things up in the 32 mode doesn't seem to have this effect in the 64 mode.

As the Basic is copied in the 64 mode to the RAM, there must be a new location where I can POKE and get extra speed.

Maybe you could tell me what is the 64 mode's equivalent to the speed POKE in the 32 mode?

Jacov Lever
26 Henrita Sold Street
49532 Petah-Tikva
Israel

THE INFAMOUS "speed up" poke has been mentioned regularly over the years on this and other pages. POKE 65495,0 actually causes the processor to run at double speed when accessing ROM. As the Basic is normally stored in ROM it has the effect of speeding up Basic programs. Machine code programs stored in RAM do not run any faster with this poke.

In 64k mode the Basic is, as you say, stored in RAM and so does not run any faster than normal as the processor is not accessing ROM memory. There is no equivalent "speed up" poke for RAM I'm afraid.

Printer Problem

I HAVE a Tandy dot matrix printer running with my Dragon and I occasionally notice characters being randomly repeated throughout listings. I have had the printer checked but I'm told there was nothing wrong with it. Could this be a fault with my Dragon's centronics port?

I have a Dragon 32 and DragonDos.

Trevor Elmer
Plumstead
London SE18

THE PROBLEM is actually caused by the interrupt routine. With DragonDos attached the interrupt routine, which runs 50 times a second, is so long that if it occurs between the strobe line being switched (which tells the printer that there is data at the port) then there is time for the printer to take two characters — hence the repeated characters which seem to randomly appear in listings.

The solution is simple — disable interrupts before sending information to the printer with;
POKE 65283
PEEK (65283) AND 254
and re-enable them after printing with;
POKE 65283
PEEK (65283) OR 1



OVER THE last few months I've had lots of letters from readers generously offering to share their adventure successes by giving clues and sometimes complete solutions to games, while at the same time I've been getting letters from new readers and adventurers asking for more hints for beginners. There's never enough space to list all the clues people send me every month, so I've decided to catch up with the backlog this time and have a bumper column of clues and solutions. As always, any information that might be too revealing will be printed backwards to prevent it being seen by anyone who doesn't want to know the answers, though some of the more general clues will be printed ordinarily.

Beverley Lewell of Nuneaton has solved *Syzygy* and offers the following advice:

1) Big ugly creatures don't like things thrown at them
2) Read numbers carefully
3) To kill Darth needs patience
4) Carry as much as you can
5) Holding your breath is a very useful exercise

More on *Syzygy* from Darren Cash of Birmingham:

1) To kill alien: TITA YZZU FWO RHT
2) To get in deep pit: GNIR TSDN ATEK NALB GNID LOHE LIHW PMUJ
3) To help in killing Darth, unplug right joystick and use left joystick, trying to keep your light sword crossing over Darth Vadar's.

Juxtaposition

John Baker of 106 Bishopswood, Brackla, Bridgend, Mid Glamorgan has written with lots of clues and answers on *Juxtaposition*, which he says he solved in a few sittings but enjoyed very much nevertheless. If anyone's stuck, write to John with a sae, but meanwhile some of the following general advice might help:

1) Examine all objects you find
2) Most items have a logical use and are only needed once
3) Eat regularly or you'll weaken before the end
4) Always carry your ID tag
5) If night falls then get inside quickly
6) Save the game regularly, as several things happen which may catch you out.

John's also sent lots of specific answers to problems, while many readers seem to be having trouble dealing with the droids at the start of the game. The first droid you meet can be avoided if you don't immediately rush out into the corridor, and afterwards listen carefully for its approach to enable you to hide. You should be able to get over the balcony and out of the first few locations — perhaps an idea might come to you in bed? After that you will then encounter another droid. To deal with this one you will need what might be called a solution.

Darren Dollery of Hayling Island has sent a few tips for the cheats among you. In *Lost in Space*, for protection against the security robots you can add TR(9)=0 at the beginning of Line 1610 in the program. In *Towers of Death* you can get yourself a permanent cloak by adding L(1,13)=50 at the start of Line 1100, and a permanent hammer by adding L(1,27=50 at the start of Line 1200.

Ice Kingdom

Just to show he can solve adventures the proper way, too, Darren sent a few clues for *The Ice Kingdom*:

1) In the armoury: SREG ITEH TFOE NOFO DAEH LLUP
2) To get past the snowman: KCIT STN IOP
3) When you meet the small giant: SELO PEHT MIHE VIG

I've received several clues from Damian Royal of London SW15, firstly on *El Diablero*:

1) The coyote is not who he seems to be
2) To enter the cave in the canyon: EVA CEK AWAN EHTM AERD
3) Found the magic bush? GIW TASN IATN OCTI
4) Got a twig? LIO NIT IPID
5) Man with machete a problem? ELB BEPE ULBW ORHT

And secondly on *Time Machine*:

1) To get out of the dark opening: RABW ORCH TIWR EVEL MAJN EHTR EVEL LLUP
2) Generator? REMM AHHT IWTI KAERB
3) Police-box? TIE RON GI

A few months ago in the advantage contact section a reader named J.P. Thorpe was asking for help in *Franklin's Tomb*, but unfortunately his address was omitted. R. Tuck of Chippenham took pity and sent the solutions in to me:

1) To get into the water room, go to where the walls have ears and say a word that connects the pictures on the walls that you pass on your way there. (You almost need a clue to the clue on that one.)
2) To give the rabbit the carrots: TIBB ARDE EFYL PMIS
3) To open the sarcophagus: RALLEC ENIW MORF ENIW RUOP

If there was a Eurovision Adventure Contest then Rolf Michelsen of Norway ought to stand a good chance of winning, as he's sent me solutions to no less than six adventures. Is there nothing else to do in Norway, Rolf?! I'm very grateful to him for taking the trouble to do this, the adventures he's covered being *Juxtaposition, Secret Mission, Caverns of Doom, Time Machine, Lost in Space* and *Wings of War*. I'll pick a few hints out of each, starting with *Juxtaposition*, where two readers have already written to me saying they've been having trouble dealing with the Nighteye Droid:

1) Nighteye Droid? ARE MAC EHTE SUOS THGI LTHG IRBS ETAH
2) Caretaker a problem? EEF FOCS IHNI SLLI PGNI PEEL STUP
3) To get back across the river: TINU REDN ESEH TESU
4) To disarm the bomb: EULB DERN EERG DERE ULBS SERP

Some of Rolf's clues on *Secret Mission*:

1) To reach the ledge: RED ROCE RHTI WWOD NIWK AERB
2) No use for the mop? TIK SIRF
3) To get into control room: ROO DEHT KCIK

In *Caverns of Doom*:

1) To open toolchest: NOT ELE KSEH TENI MAXE
2) To move raft over deep water: LLAF RETA WDNI HEBT AOBR EDNU KOOL
3) To get rid of the large bear: RAEBT ANUG ERIF

In *Lost in Space*:

1) To escape the maze: KWAH WORR APSW OLLO FDNA DNIF
2) To find blue disk: EIPT AEDN AENI HCAM DOOF NIKS IDETI HWTR ESNI
3) To open security box: NILK NARF SIDR OWS SAP

For *Wings of War* Rolf has included the following clues:

1) To find a car to escape in: ECAL PERIF RAEN STEK CARB NRUT
2) Key for car? ECAL HTIW TOOB SREC IFF OXIF
3) How to fix the container? MUIN IMUL AFOP ARCS DNAH CNER WESU

Steve Barritt of 126 The Medway, Daven-

try, Northants NN11 4QX has already been mentioned in these pages and repeats his offer to help anyone stuck in *Madness and the Minotaur.* Steve has also now sent me some more information on the game, including several maps, so I'm going to have to see how best to make use of these. Meanwhile, here's a note of the effects that various spells in the game have:

Vetar: PMAL SERO TSER
Mitra: GNI TSN OIPR OCSS ERUC
Akhirom: BARAC SGNI YRRA CFIN OITC ETOR PEMO SSRE FFOD NAAR DYHS LLIK
Okkan: ERUSA ERTS DNIF
Nergal: GO FSLE PSID
Belrog: SPM UJSE ETNA RAUG
Crom: HTAP SKCO LBNU
Ishtar: TSE ROF OTUO YEKA TOTS EMIT EERH TESU

I've had several letters now from adventurers in Israel, where there seem to be plenty of Dragons about, and the latest is from Dudi Menuhin, 1 Haartsit Street, Qiriat Haagana 76568, Rehovot, Israel. Dudi is an enthusiastic correspondent, like all the Israeli adventurers I hear from, so if anyone would like to correspond with him (or her, I'm never quite sure with Israeli names!) then I'm sure Dudi would like to hear from you. Particularly if you're having trouble with *Trekboer*, on which Dudi offers help and a few clues:

1) To kill the spider: ELU SPA CEHT EVIG
2) To see the dark room: HCT IWSE TIHW SSER PDNA DIUQ ILRU OPNE HTRE KAEB LLIF
3) Xendos flower? MOOR KRAD EHTN ITIT NALP

Trekboer has also been solved, and help is also offered on it, by Eran Tal-Shahan, Brey-Efrayim 215/3, 69984 Maoz-Aviv, Tel-Aviv, Israel, and if you're in the mood for writing abroad and perhaps swapping some software then contact Daniel Merkez, 6 rue de Vouille, 75015 Paris, France. Daniel's interested in getting hold of some of the more recent Dragon adventures and offers in exchange your choice from his collection of over 600 arcade and adventure titles. I didn't realise there was quite that much Dragon software around.

Anyway, I hope you've found this month's bumper crop of clues helpful, and I'm sure you're grateful, as I am, for all the readers who have taken the trouble to send information in. Thanks folks.

Adventure Contact

To help puzzled adventurers further, we are instituting an Adventure Helpline — simply fill in the coupon below, stating the name of the adventure, your problem and your name and address, and send it to Dragon User Adventure Helpline, 12/13 Little Newport Street, London WC2H 7PP. As soon as enough entries have arrived, we will start printing them in the magazine.

Don't worry — you'll still have Adventure Trail to write to as well!

Adventure ....
Problem..............................
....
Name ....
Address..............................
.... **Mar 86**

Adventure Contact

Adventure Shenanigans **Problem** I have gold token, Knife, Shoes, Torch, Clothes and Wallet. What do I do now? **Name** Cwan Mennie **Address** 15 Wiseman Road, Elgin, Moray, Scotland, IV30 1SY.

Adventure The Cricklewood Incident **Problem** How to get past the White Rabbit? **Name** Conrad Meyer **Address** 5 Coburg Road, Dorchester, DT1 2HN

Adventure Shenanigans **Problem** How to cross the deep ravine in the caves and how to find a use for the 12ft pole. **Name** Matthew Wells **Address** 45 Forsetside Drive, Banchory, Kincardineshire, Scotland, AR3 3ZG.

Adventure Trekboar **Problem** Cannot get past the second spider or find a command for the grate. **Name** David Griffiths **Address** 18 Sedgemoor Court, Newport, Gwent, NPT 5EQ.

Adventure Juxtaposition **Problem** Cannot find Monocar to start journey (have escaped the droid and am on the street level). **Name** David Griffiths **Address** 18 Sedgemoor Court, Newport, Gwent, NPT 5EQ.

Adventure Ring of Darkness **Problem** Everything – I need help!!! **Name** Paul Venables **Address** 15 Waveney Drive, Belton, Gt Yarmouth, Norfolk, NR31 9JU.

Adventure The Ket Triology **Problem** How do I go from the mountain onwards? I've got the wand and won the Magic Scimitar, but I cannot find my way any further. **Name** V Garrett-Smith **Address** 4 Beacon Road, Bodmin, Cornwall, PL31 1At.

Adventure Juxtaposition **Problem** How do I get into Baron's White's Fort, The Pyramid, The Shaft, etc? **Name** Nigel Nicholls **Address** 10 Wensum Way, Belton, Great Yarmouth, Norfolk, NR31 9NY.

Adventure Mountains of Ket **Problem** I didn't convince the Cartographer to let me go to the second floor of his house. **Name** Dario Palmieri **Address** Via Molino Di Pescarola 72, Bologna, 40131, Italy.

Adventure: Juxtaposition. **Problem:** How to get out of the domed city? **Name:** Stephen Sharman. **Address:** 11 Church Lane, Caldesott, Market Harborough, Leicester LE16 8RW.

Adventure: Syzagy. **Problem:** Have got light sabre and found transporter, but how do you use it and what do you do in the garden area? Can offer help with Juxtaposition, Ring of Darkness and Return of the Ring. **Name:** Stuart Beesley. **Address:** 3 Stockton Close, Charlton Kings, Cheltenham, Glos.

Adventure: Juxtaposition. **Problem:** How do you get down to the balcony? **Name:** Gerrard Purnell. **Address:** 35 Murton Lane, Newton, Swansea.

Adventure: Shenanigans. **Problem:** What use is the 12 foot pole and how do you get it into the cave? **Name:** Andrew Kain. **Address:** 185 Blue Acre, Clock Face, St Helens, Merseyside.

Adventure: The Criclewood Incident. **Problem:** What is the two word command which enables you to enter the bus and train? **Name:** J. R. Claxton. **Address:** Swin Coots, Stubb Road, Hickling, Norwich, Norfolk NR12 0YS.

Adventure: Trekboer. **Problem:** How do you get past the force field? **Name:** Lorna Tiney. **Address:** 14 Matson Close, Rothwell, Northants NN14 2AY.

Adventure: Madness and the Minotaur, Ring of Darkness, Lost in Space. **Problem:** Everything . . . all I can do is get killed! **Name:** Alan M. Coleman. **Address:** 15 Eustace Street, Warrington, Cheshire.

Adventure: Pirate Adventure. **Problem:** How do you get to Treasure Island from Pirates Island? **Name:** Douglas Field. **Address:** 14 Lawnswood, Messle, N. Humberside MU13 0PT.

Adventure: Trekboer. **Problem:** How do you pass the force field on the garden planet? **Name:** Martin Waller. **Address:** 3 Axe Bridge Avenue, Sutton Leach, St Helens, Merseyside.

Adventure: Juxtaposition/Return of the Ring. **Problem:** How to find Deed of Brown also how to get away with Eridani Emerald? How to use the Ring? **Name:** Graham Naylor. **Address:** 30 Haugh Lane, Newhey, Rochdale, Lancs.

Adventure: Ket Triology. **Problem:** How do I get past the skull in the caves? **Name:** Stuart Jones. **Address:** 9 Heath View Crescent, Dartford, Kent.

Adventure: Shrunken Scientist. **Problem:** How to get from the river from the window? Also need help with El Diablero. **Name:** Phil Goldie. **Address:** 293 Upper Elmers End Road, Beckenham, Kent.

Adventure: Juxtaposition. **Problem:** Many and various. **Name:** Robert Gassmann. **Address:** 33 Ashley Road, Marnhull, Dorset DT10 1LQ.

Puzzle it out!

A conundrum creator brought to you by C L Naylar

PUZZGRID will create the familiar 'find the words in the grid' puzzle from your own set of 10 words.

Initially you will be asked to input your 10 words. Naturally with the 10 × 10 grid they must not be longer than 10 letters and in practice it is better to input the longer words first; the puzzle will be produced in a much shorter time.

After the 10th word has been input you can watch as the computer finds places for all the words in the grid. Finally it fills all the empty spaces with randomly chosen letters and the words are listed alongside the puzzle.

You are then given the option of a printout in the form shown in Fig. 1, creating a different puzzle using the same words, or making a completely new puzzle. If you are just doing a one-off puzzle for your pal, then of course he'll have to look away while it is being produced on screen.

The program is relatively simple. The grid is made up from a number of strings which are then manipulated in Lines 110-260 to fit in your chosen words. A random direction and initial position in the grid are chosen and the current word is temporarily tried for a fit. If it won't fit, this process is repeated until it does.

The whole routine is then repeated for the next word and so on until all 10 words are in. Lines 270-290 then fill the 'holes' with random letters.

The Printer dump peeks the text screen to produce the final puzzle.

```
Find the words hidden in the Grid
Across, Down, Diagonally or Backwards

Z S V F E X P E R T          EXPRESS
W X S I N T E N D L          STRIDE
A O G E S T R I D E          COMPUTER
H N L K R H S J C V          INTEND
F I B T T P S Z W A          BOX
A K O N N X X Q Q W          PARTY
B B X D I N N E R N          DINNER
L F R E T U P M O C          ABLE
E B Y T N E C S B N          SCENT
E P A R T Y N V M V          EXPERT
```

Program Listing

```
10 '*****************************
20 '*** PUZZGRID BY C.L NAYLAR**
30 '*****************************
40 '
50 CLEAR400:RESTORE:CLS
60 PRINT@332,"puzzgrid";:FOR L=1 TO 1000:NEXT L
70 DIM GR$(144),N$(10),DI(8)
80 GOSUB450:GOSUB580:GOSUB640
90 GOSUB390
100 '--------------FIND POSITION
110 FOR P=1 TO 10
120 PRINT@14+((P+1)*32),P;
130 PRINT@18+((P+1)*32),N$(P);
140 R$=N$(P)
150 NX=RND(144)
160 PRINT@17+((P+1)*32),CHR$(128);:PLAY"T20O5C":PRINT@17+((P+1)*32),CHR$(143);
170 IF GR$(NX)<>"#" THEN 150
180 DIR=DI(RND(8))
190 L=LEN(R$)
200 CS=0
210 FOR N=0 TO L-1
220 IF GR$(NX+(N*DIR))=CHR$(159) OR GR$(NX+(N*DIR))=MID$(R$,N+1,1) THEN CS=CS+1
ELSE 150
230 NEXT N
240 IF CS=L THEN V=1:FOR N=NX TO NX+(DIR*L) STEP DIR:GR$(N)=MID$(R$,V,1):V=V+1:N
EXT N
250 GOSUB390
260 NEXT P
270 FOR A=2 TO  11:FOR B=2 TO 11
280 IF PEEK(1024+A+B*32)=159 THEN POKE 1024+A+B*32,64+RND(26)
290 NEXT B,A
300 PRINT@32*13," P = PRINTOUT";
310 PRINT@32*14," R = FOR SAME WORDS NEW PATTERN";
320 PRINT@32*15,"   ANY OTHER KEY = NEW PUZZLE";
330 SCREEN0,1:PLAY"T8O3CFFCFGAO4C":POKE&HFFD6,0
340 A$=INKEY$:IF A$="" THEN 340
350 IF A$="R" THEN CLS:GOSUB 450:GOTO90
360 IF A$="P" THEN GOTO 720
370 GOTO50
380 '------------------DRAW GRID
390 C=1:PLAY"T20O05CDEFGAB":FOR A=1 TO 12
400 FOR B=1 TO 12
410 PRINT@A*32+B,GR$(C);:C=C+1
420 NEXT B,A
430 RETURN
440 '-----------STRINGS FOR GRID
450 FOR N=1 TO 144:GR$(N)=CHR$(159):NEXT N
460 FOR N=1 TO 12:GR$(N)=CHR$(128):NEXT N
470 FOR N=132 TO 144:GR$(N)=CHR$(128):NEXT N
480 FOR N=1 TO 132 STEP 12:GR$(N)=CHR$(128):NEXT N
490 FOR N=12 TO 144 STEP 12:GR$(N)=CHR$(128):NEXT N
500 RETURN
510 FOR J=1 TO L
520 GR$(NX+((J-1)*DIR))=MID$(N$(P),J,1)
530 NEXT J
540 GOSUB390
550 RETURN
560 END
570 '---------READ DIRECTION DATA
580 FOR X=1 TO 8
590 READ DI(X)
600 NEXT X
610 RETURN
620 DATA -1,1,12,-12,-13,13,11,-11
630 '-----------------INPUT WORDS
640 CLS
650 PRINT"   PLEASE INPUT YOUR TEN WORDS":PRINT"WHICH WILL BE HIDDEN IN THE GRID
";
660 PRINT:PRINT
670 FOR N=1 TO 10
680 SOUND80,1
690 PRINT"WORD ";N;:INPUT N$(N)
700 NEXT N:FOR T=1 TO 500:NEXT T:CLS:RETURN
710 '-----------------PRINT OUT
720 SOUND100,5
730 PRINT#-2,"Find the words hidden in the Grid"
740 PRINT#-2,"Across, Down, Diagonally or Backwards"
750 PP=1089:T=1
760 PRINT#-2,CHR$(13);
770 FOR N=0 TO 10
780 Q=PEEK(PP+N)
790 PRINT#-2,CHR$(Q);" ";
800 NEXT N
810 PRINT#-2,"          ";N$(T);:T=T+1
820 PRINT#-2,CHR$(10);
830 PP=PP+32:IF PP>1380 THEN 340
840 GOTO770
```

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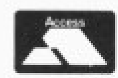
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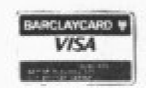
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MARCH PUZZLE

***Gordon Lee** sets the pace — and this month there are 25 copies of Quickbeam's 6809 express to be won*

IT IS remarkable to think that it was only just over a decade ago that the first simple pocket calculators were making their first appearance on the domestic market. These early models generally had just the four basic mathematical functions — addition, subtraction, multiplication, and division, and consequently it was sometimes necessary to devise methods of calculating values whose functions were not provided on these machines. The calculation of square roots is a case in point. Readers who are familiar with the classical "pencil and paper" method for the extraction of square roots will appreciate the complexity of this method, and will realise the advantage of an easier method of calculation. Nevertheless, the calculation of square (and cube) roots using just the four basic mathematical functions is still possible. It may be thought that this method has now only a curiosity value, but the actual technique is still applicable in solving problems in computing which do not lend themselves to other, more conventional, methods of solution. This month's competition problem may well be such a case!

But first, the method for finding square roots is as follows:

1) Make a rough guess as to what the square root might be.
2) Square this value (using the ordinary multiplication function).
3) Compare this result with the original number.
4) Adjust your guess by a proportional amount to give you a revised value.
5) Go to step 2.

By continuing the procedure until the square of the guess is the same as the number whose square root we are trying to find, we arrive at the correct root by a method of approximation. In actual practice, using a simple calculator, an accuracy of eight significant figures can be obtained in only five or six reiterations of the sequence of operations. Mathematically, this is known as a "reiterative" method of solution because the method uses each solution as a basis for a further, more accurate, assessment. In effect, the calculator is "learning" by its own mistakes.

This can be translated into the following BASIC program:

```
1 INPUT "ENTER NUMBER ;R : GUESS = R/2
2 S = GUESS*GUESS
3 IF ABS(S−R)<0.00001 THEN PRINT "THE SQ. RT. OF";R' " IS"; GUESS
4 A=(GUESS+R)/2 : GUESS=(R*GUESS)/A
5 GOTO 2
```

The unusual line numbering of this program is so that each line corresponds with the step numbers of the method outlined earlier. If the command PRINT GUESS is added to the end of Line 2, and the program run for a couple of trial examples, it will be noticed that each successive value computed rapidly stabilises towards the correct evaluation of the square root. The final accuracy is dependent on the mathematical accuracy of the computer, but all mathematical operations are subject to this restriction. Curiously, the accuracy of the original guess at the start of the operation is not at all critical. This guess can be wildly out without affecting the final result, the only difference being the number of reiterations carried out before the result stabilises. In fact, the program listed dispenses with the need to input a guess as it takes as its first approximation a value of half the number whose root we wish to find.

The creation of such an interactive loop may provide a method of solving the following problem posed recently by Professor Otto Hex to some of his students:

"I have here", announced the professor, "two *imaginary* spheres, each one a foot in diameter." The professor stood with his arms outstretched, balancing each imaginary sphere on the fingertips of each hand.

"You will realise that the volume occupied by each sphere is a little over half a cubic foot, which will make the total volume of both spheres to be slightly in excess of *one* cubic foot.

"Now, if I slowly move the spheres closer together there will come a time when the two spheres being to merge. Unlike real spheres, they do not distort, but like ghosts, they just melt into one another, with the extra volume of the overlapping portion just disappearing.

"You will understand that, if I continue merging the spheres until they are both exactly superimposed I would be left with a single sphere with its original volume of just over half a cubic foot. The second sphere would have vanished.

"What I would like to know is, how far apart are the centres of the spheres when the total combined volume is *exactly* one cubic foot?"

That was the professor's problem. To solve it you will need to know that the volume of a sphere is given by $V=4/3\pi r^3$, and also that the volume of a spherical segment is given by $V=1/3(\pi h^2(3r-h))$. Note that if a slice is removed from a sphere by means of a straight cut, the small lens-shaped piece produced is called a spherical segment. In the formula r is the radius of the sphere itself, and h is the height of the segment; (if it is laid on its flat cut surface, the height of the curved dome).

Prize

This month we are offering 25 copies of 6809 Express from Quickbeam Software — a sort of cross between Rambo and Thomas the Tank Engine, where you must rescue your captured comrades in your locomotive. Can't be bad . . .

Rules

To win your Quickbeam game, you must first show the answer to the above competition, and demonstrate how you solved it with the aid of your Dragon. Please do not send in a cassette containing your program. Make sure that your name and address are clearly printed on your entry, and mark the envelope "March Competition". Envelopes which do not state which month you are entering for will be disqualified.

As a tie breaker for this month, we're asking you to finish the phrase, "The train now approaching Platform Five . . ." in not more than 12 words. Marks will be given for originality, wit and good spelling.

December Winners

This month winners get a copy of Microdeal's adventure game Trekboer. Congratulations go to Simon Aubrey of Swindon, Wilts, R G Woods of Oakleafe Gardens, Barkingside, Ilford, Essex, Mr E C Hasted of Plaxtol Road, Erith, Kent, M Ingram of Broadlea Avenue, Leeds, E A Newman of New Haw Rd, Addlestone, Surrey, Rachel Edmunds of Sedgefield, County Durham, M W Stonton, Bridge Road, Stoke Bruerne, Towcester, Northants, J W Davis, Radnormere Drive, Cheadle, Cheshire.

Interesting tie-break answers (I want to visit a Dark Star because . . . .) included, "because all my friends have been!", "because I want to go where no hacker has gone before," and "my wife hid her orange egg in one".

Apologies to anyone who hasn't received their rightful puzzle prize recently — we've been having a spot of bother in that department. If you're one of the unlucky ones, then drop us a line and we'll pop it in the post.

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